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TROPICAL DISEASES BULLETIN.

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THE AETIOLOGY OF THE SPRUE SYNDROME.

A Critical Review.

By Philip Manson-Bahr, C.M.G., D.S.O., M.D., F.R.C.P.

Sprue represents a typical syndrome, embracing an assembly of signs and symptoms such as should distinguish it as a definite disease which apparently originates in certain parts of the tropics and sub-tropics. When it commences, as it so often does, in England in erstwhile residents of the Far East it may become the object of a diagnostic dilemma. Apart from being somewhat of a medical oddity, sprue has achieved popular notoriety as a disagreeable malady which may yield to an agreeable remedy in a diet of strawberries.

The sprue syndrome has long been known to medical science, having been well described by a Dutchman, V. Ketelaer (1672) in the Dutch East Indies and later by an Englishman, Hillary (1766) in Barbados; but real scientific interest in this disease may be said to date from the writings of a Scotsman, Patrick Manson (1880), in China, and another Dutchman, van der Burg (1880), in Batavia. As then, so now, the origin of the disease is wrapped in mystery, but as the result of recent investigations and of the well-attested fact that it is apt to affect residents of long-standing in the Far East, Manson's jest that sprue might well constitute the past participle of the verb "to spree" may well be not far from the mark.

The main points about sprue are that it is chronic in its course, distressing in its symptoms, proceeding, if unchecked, to a miserable long-drawn-out end. In its geographical distribution it exhibits a marked preference for the Far East—India, Ceylon, Malaya and Southern China—but it is also found to a lesser extent in the West Indies, the neotropical regions and even in the Southern United States. For some as yet unexplained reason, sprue is absent from, or extremely rare in, Central Africa, though the reviewer (1928) has described an authentic case from Nyasaland. The disease shows a marked preference for the light-skinned European, but is occasionally seen in the Mongolian races, in the Malays and in Indians. It appears to be rare in the highly-pigmented Tamil and negro races. Both sexes are almost equally affected (given equal opportunity) and it attacks adults, but children under 15 very rarely; the youngest recorded being 11 years of age [Miller (1933)], for usually the sprue attack commences in the third or fourth decade of life. The tendency to remissions is one of

its chief characteristics, and most extraordinary of all is its latency, in which it surpasses almost any other chronic disease. It can commence apparently *de novo* twenty-five or even forty years after the patient has left the supposedly endemic area [MANSON-BAHR & WILLOUGHBY (1930)]. Several instances of this have come under the reviewer's observation.

Sprue is characterized by diarrhoea of a peculiar kind—the passage of copious, pale, fermenting and foul-smelling stools—by emaciation, glossitis, stomatitis, meteorism, cramps and tetany, and, finally, by a severe megalocytic anaemia generally acknowledged to be indistinguishable from that of true pernicious anaemia. The biochemistry of sprue suggests that the composition of the stools may be due to intestinal hurry and to the non-absorption of already partially split fats, whilst the blood chemistry is characterized by decreased assimilation of calcium and glucose, also due to the same fundamental cause. Pernicious anaemia and sprue have many features in common so that it has been suggested from time to time that the former may constitute a geographical variety of the latter. It is now becoming clearer that pernicious anaemia also exhibits certain geographical peculiarities, being especially prone to afflict peoples of the northern hemisphere and extremely rare or absent in native tropical races, so much so that, as far as their range is concerned, the one might almost be the counterpart of the other [DE LANGEN & LICHTENSTEIN (1936)]. But against the assumption of the identity of these two diseases may be advanced general habit and course, emaciation, diarrhoea, abdominal symptoms, and tendency to spontaneous cure in temperate climates, in all of which sprue differs from pernicious anaemia. In response to liver treatment (extrinsic factor), however, there are parallel features between these two distinct conditions.

Every effort to associate sprue with any definite micro-organism peculiar to those countries in which it occurs, or with any other specific predisposing cause has failed, so that study has in recent years been mainly devoted to its biochemical aspects. In the reviewer's experience one fact appears certain, that in frequency and severity the incidence of sprue has diminished in recent years, and, therefore, this possibly depends to some extent on improved hygienic and dietetic conditions.

There are some plausible reasons for associating sprue with pellagra, mainly because they have several features in common, are apt to occur in the same countries and, also, because the glossitis and stomatitis of sprue appear to be of the same nature, reacting in the same manner to the vitamin B_2 complex and dietetic therapy as do those of pellagra. Furthermore, pellagrous dermatitis may be engrafted upon cases of long-standing sprue, as indeed it may upon any other chronic intestinal disorder; but primary pellagra usually occurs in underfed peasants subsisting on an ill-balanced dietary. Thus, it is generally acknowledged to be an avitaminosis due to the absence of the PP factor (vitamin B_2), and this has been abundantly proved by its experimental production in man as well as in animals, notably in the disease known as "black tongue" in dogs, which is curable by nicotinic acid. "Secondary pellagra" in chronic alcoholics, in patients suffering from chronic intestinal disease, or as the result of surgical interference with the gastrointestinal canal (as quoted by SPIES and his colleagues) influencing normal absorption is now well recognized. (Similarly pernicious anaemia and the sprue syndrome *may* be produced by

surgical interference with the stomach and small intestine, as is later emphasized in this review.) But there are several points in common between these two apparently dissimilar diseases. The main distinction lies in the photosensitive pellagrous dermatitis, the tendency to seasonal incidence, the character of the associated anaemia and the liability to involvement of the central nervous system leading to dementia. The porphyrinuria of pellagra recently described [Beckh, Ellinger & Spies (1937)] may be due to absorption of amino bodies from the bowel [Chalmers, Gillam & Kench (1940)]. In connexion with this point Rau (1940) has stated that a congenital porphyrinuria is recognized which exhibits photo-sensitive skin lesions and is amenable to vitamin B_2 treatment, whilst Spies (1938) has shown that in pellagra the coproporphyrinuria disappears with nicotinic acid treatment, but on the whole the biochemistry of the stools differs from that of sprue, though pale, fatty, fermenting stools may sometimes be observed. It is only in its nerve complications that pellagra forms a link with the "subacute combined" complication of pernicious anaemia.

A further difficulty arises in understanding the true nature of sprue in the case of two other apparently closely related steatorrhoeas—namely, coeliac disease, which appears to be a congenital absorptive defect in childhood, responds mainly to dietetic treatment and is associated with rickets, genital dystrophies, tetany, meteorism, megacolon and emaciation; and idiopathic steatorrhoea, a similar disease in adults of the second and third decades of life which is associated with osteomalacia, megacolon and anaemia, frequently assuming the pernicious type, a tendency to haemorrhages and changes in the hair and nails [Bennett, Hunter & Vaughan (1932)]. The resemblance to tropical sprue is great, in so far as the biochemical background in both these last-named disorders is practically identical with it. The faeces have a similar composition, again the result of intestinal hurry and of the inability of the cells of the small intestine to absorb fats; the pancreatic functions being, as far as can be ascertained, normal. The blood chemistry is on the whole similar, the result probably of malabsorption from the small intestine. Idiopathic steatorrhoea in adults is now generally regarded as a "hangover" of former coeliac disease in infancy. There is here again delayed onset comparable to what occurs in "delayed sprue." It differs mainly from sprue in the bone changes, the almost invariable presence of megacolon and in its intractability to liver and vitamin B_2 treatment. The anaemia is usually not by any means so severe and some cases proceed to a fatal issue without the supervention of any gross blood changes.

This last problem has been further complicated during recent years by the description of a fourth variety of steatorrhoea in Northern European countries, and also in the United States, which has been christened "non-tropical sprue." The reviewer described a case of this condition as "indigenous sprue" in 1929 [Manson-Bahr (1929)] and several other cases were cited by various workers in Germany and Holland, but their true import was discounted when the true facts about idiopathic steatorrhoea became more generally appreciated. In 1932 H. Thaysen wrote a monograph on non-tropical sprue from which it appears that a number of cases in Denmark and Norway resembled true tropical sprue in their clinical course, appearances and reaction to treatment, and from this he decided that the latter

disease was no longer tropical in origin [THAYSEN (1935)]. Criticisms levelled at this view were based at that time on the supposition that in several instances he had confused the issue between tropical sprue and idiopathic steatorrhoea. The existence of a sprue-like disease in England distinct from the latter and in which the biochemical findings resembled true sprue has been confirmed quite recently by BENNETT and HARDWICK, and now the reviewer has encountered two other cases falling into this category in London which, if they had recently arrived from the tropics, would certainly have been diagnosed as tropical sprue and which have reacted in the same satisfactory manner to nicotinic acid and vitamin B_2 treatment. It would, therefore, appear necessary to enquire into the vexed question as to whether sprue is after all a true tropical disease, or whether it merely represents an accentuated form of what really is a world-wide malady. The above comparisons and suggestions have led the reviewer to ponder further whether sprue is a definite and distinct disease rather than a clinical state due to damage to the mucosa of the small intestine; in other words due to "chronic jejuno-ileal inefficiency."* That the "sprue syndrome" is the clinical expression of disease of the small intestine has been made sufficiently clear by BENNETT and HARDWICK (1940) who introduced the term "insufficiency" in the same sense. There is little doubt that the sprue syndrome may be produced by a number of diverse surgical and medical conditions. The main argument in this direction lies in clinical observations on gastro-jejuno-colic fistula [DE RIVAS (1930); FAIRLEY & KILNER (1931)], which produces the main clinical and biochemical manifestations of sprue, including glossitis and megalocytic anaemia. A similar clinical state has been observed as the result of an ill-functioning gastrojejunostomy, a case of which has been investigated by the reviewer. Other well-accentuated diseases of the small intestine which interfere with its functions may produce the same end result, such as ulceration of the ileum, blockage of the lymphatic supply of the bowel, as in tabes mesenterica, lymphadenoma, lymphosarcoma of the mesenteric glands [FAIRLEY & MACKIE (1937)], whilst malignant disease of the small gut† may do the same. It now seems as if some logical order could be evolved from what has seemed clinical chaos.

Shortly after the discovery of the identity of nicotinic acid with the PP factor, this substance was introduced for the treatment of pellagra by SPIES in 1937 [SPIES (1938)]. He based his assumption mainly on the observed effects of this substance on the correlated "black tongue" disease in dogs.

From the commencement it was noted that nicotinic acid exerted its most profound and easily observable effect upon the glossitis and stomatitis of pellagra and later upon the mental manifestations of this disease. Soon came the discovery by SEBRELL & BUTLER (1939) of the existence of another factor in *cheilosis*, or angular stomatitis, which they regard as the chief sign of "ariboflavinosis" and which is amenable to riboflavin therapy.

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* It is suggested that "inefficiency" would best explain the inability of an organ to exert its proper and normal functions and in this sense it is employed in this review.

† A case of this description has occurred in the reviewer's practice in a patient who had been regarded as sprue for five years and eventually died of a neoplasm of the jejunum.

The reviewer claims [MANSON-BAHR (1940)] to have demonstrated that the therapeutic effect of nicotinic acid on the sprue tongue and of riboflavin on angular stomatitis of sprue is similar to that found to obtain in pellagra, and this observation has now led him to apply this form of therapy to sprue cases in general. The results so far obtained in 24 severe cases of tropical sprue would indicate that this constitutes a highly satisfactory method of treatment; the glossitis is healed within a period of four days and the intestinal symptoms, especially the meteorism, improve shortly afterwards. Finally, the diarrhoea ceases entirely and the stools become normal in size and colour. Indeed it seems to be the most satisfactory method of treatment for tropical sprue yet introduced. The dose of nicotinic acid necessary to bring about this result is 300 mgm. daily for one month, and if angular stomatitis is present, the addition of riboflavin 3 mgm. daily is also advisable.

As far as observations have gone at present, it is permissible to state that nicotinic acid is also effective in the glossitis of pernicious anaemia and in that occasionally seen with subacute combined degeneration of the cord. It also improves the glossitis of idiopathic steatorrhoea, but, unfortunately, appears to exert no appreciable permanent effect on the intestinal manifestations of this disease. Furthermore, and in view of the implications of this basic idea, nicotinic acid cures the glossitis of the "false sprue" of gastro-jejuno-colic fistula as well. On the last two cases of non-tropical sprue which have come under treatment the effects of nicotinic acid therapy were most striking and parallel to those observed in true tropical sprue. An analysis of these assembled facts, based mainly upon clinical observation, would indicate that what has already been prophesied by ELDERS (1917), NICHOLLS (1934) and others that "sprue" is the expression of disease of the small intestine is true, and it now appears to be due to an avitaminosis through faulty absorption. It is difficult on the assumption of an avitaminosis to explain the latency of a proportion of tropical sprue cases which has already been sufficiently emphasized, but possibly the interpretation which has been put upon this phenomenon may not be correct, as they may indeed be instances of non-tropical sprue arising in a non-tropical country. It may even be necessary to postulate that what we term "sprue" is not a separate clinical condition, but an assembly of clinical phenomena denoting former damage by some specific infection of the gastro-intestinal tract with the main onus directed to the ileum; in other words, sprue is the result of dysfunction of some specialized cells in the same manner as is now generally accepted for pernicious anaemia in respect of the pyloric and Brunner's glands of the duodenum. In pernicious anaemia, however, the dysfunction is complete and permanent, necessitating the continuous replacement of the intrinsic factor to maintain health; in sprue the dysfunction is apparently temporary, and complete cure is frequently observed without the need for continuous replacement. Sprue is comparable also with uncomplicated pellagra in which no visible macroscopic or microscopic lesions can be demonstrated in the intestinal tract, but the syndrome of which is incontestably often brought about by destructive disease of the mucosa, as by bacillary and amoebic dysentery, or by extensive tuberculosis—thus giving rise to "secondary pellagra." (The coexistence of chronic bacillary dysentery with fatal pellagra was recorded by the reviewer in 1919) [MANSON-BAHR (1919)].

These facts give much food for thought and more still for temperate speculation. But this is not the whole story. There is the sore tongue disease which has been often described in this *Bulletin* and to which the reviewer drew attention in Ceylon in 1912 [BAHR (1915)] and which is often accompanied by angular stomatitis, in all regions where pellagra is endemic without any other of the conspicuous manifestations of this avitaminosis. For a long time this has been regarded as " prepellagra " or " larval pellagra," which implies that it represents one phenomenon of the incompletely developed disease. Sometimes these cases are succeeded by dermatitis and other of the cardinal signposts of pellagra. This form of glossitis too has been shown to respond to nicotinic acid therapy in the same dramatic manner. Sore tongues of pellagrous nature have been encountered by the reviewer in England and these have the same pathological features as the prepellagrous tongue of the tropics and may therefore legitimately be regarded as examples of " larval pellagra." They are found especially in women subsisting on an ill-balanced dietary, mainly because they are victims of " colitis " or some other chronic gastro-intestinal disorder. They also are amenable to a remarkable degree to nicotinic acid therapy. The reviewer claims that there is a further link indicating the underlying interconnecting factors in this group of diseases, namely, that in sprue there exists a " larval " or " presprue " condition manifesting itself in a similar glossitis which may also antedate the development of the fully-developed disease. Thus it seems that glossitis of a similar nature may precede either the sprue or pellagra syndromes and it is impossible to predict into which of the two diseases it may develop. The implications of this knowledge would seem to be far reaching and to transcend the more narrow limits of tropical medicine. It may be accepted as an axiom that study of disease in hot climates and under primitive conditions is enriched by the opportunity of observing clinical manifestations under the most favourable circumstances. Once this truth is recognized, the possibility of minor manifestations of the same process, or the same initial malady, occurring in temperate countries, where its existence has not been suspected, can be appreciated.

It is now possible to evaluate in some measure the lesson of sprue and possibly to understand the value of former and now practically discarded dietetic treatments—the milk treatment of Patrick MANSON, the beef treatment of James CANTLIE and the liver treatment of MINOT & MURPHY (which was first adopted by the Chinese ages ago for this disease), as it is now possible to conceive that the virtue of these various remedies may reside in their nicotinic acid content.

The reviewer has for some time been occupied in digesting the main facts of the résumé of this problem cited above, from which it appears that in the disease-group typified by the pernicious anaemia-pellagra-sprue syndrome the essential causative lesion is localized somewhere in the gastrointestinal tract, and is of such nature and extent as to interfere more especially with absorption of one or several of the vitamins essential to life. As stated above, the inability of the absorptive mucosal surface to perform its intricate and proper functions is best expressed by the term " inefficiency." We can, therefore, apply this idea to parts of the intestinal tract and speak about " gastroduodenal inefficiency," " jejuno-ileal inefficiency," " ileocaecal inefficiency," and so forth.

The hypothesis is therefore set forth—on the basis of clinically observed end-results of surgical interference upon the gastro-intestinal-tract—that, in order to produce the syndrome characteristic of each disease, the essential lesion should involve some particular and limited tract as illustrated in the accompanying diagram. This is still further explained in a table purporting to show the probable sequence of events. It is based upon an endeavour to fit in the already ascertained facts regarding these disease syndromes.

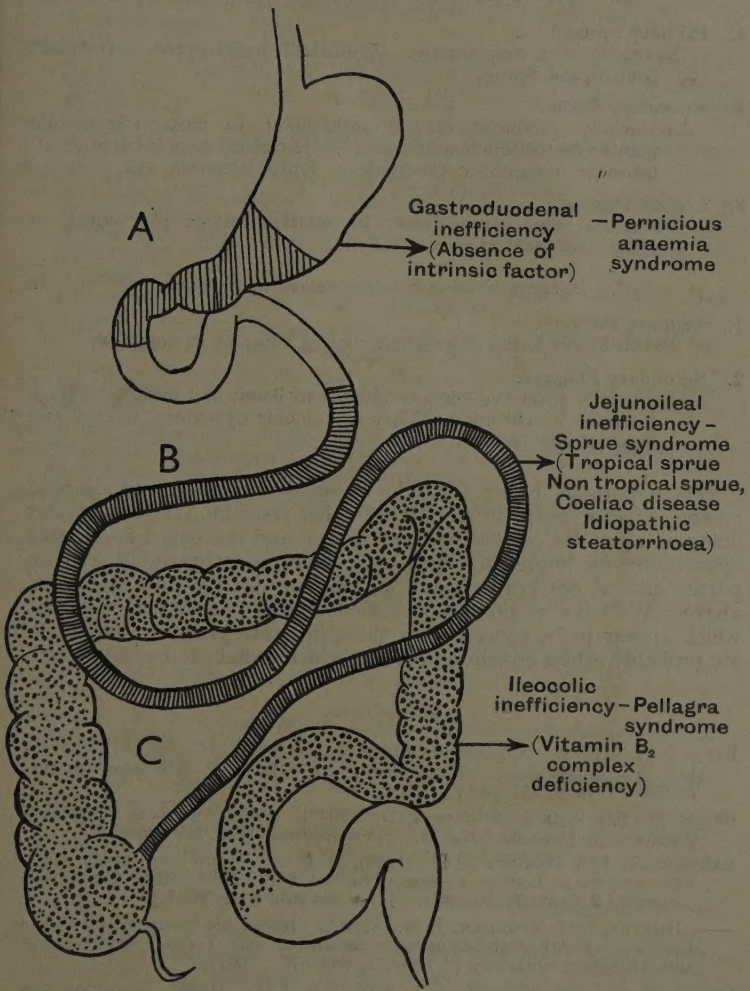
A
Gastroduodenal inefficiency (Absence of intrinsic factor)
Pernicious anaemia syndrome
B
Jejunoileal inefficiency - Sprue syndrome (Tropical sprue Non tropical sprue, Coeliac disease Idiopathic steatorrhoea)
C
Ileocolic inefficiency - Pellagra syndrome (Vitamin B_2 complex deficiency)

Diagram showing probable sequence of events in the pernicious anaemia, sprue, and pellagra group.

[The shaded portions A, B, and C, indicate the parts of the gastro-intestinal tract involved in the syndromes of pernicious anaemia, sprue, and pellagra respectively.]

TABLE.

A. *Pernicious Anaemia Syndrome*—" gastroduodenal inefficiency."

1. Primary Pernicious Anaemia.
   Naturally occurring disease (absence of intrinsic factor).
2. Secondary Pernicious Anaemia.
   Artificially produced disease subsequent to partial gastrectomy.

B. *Sprue Syndrome*—" jejuno-ileal inefficiency."

1. Primary Sprue.
   Naturally occurring disease. *Typical*: Tropical Sprue. *Atypical*: Nontropical Sprue.
2. Secondary Sprue.
   Artificially produced disease subsequent to gastro-jejuno-colic fistula, gastro-jejunostomy and short circuit, neoplasm of small intestine, mesenteric tuberculosis, lymphadenoma, etc.
3. Coeliac Disease.
   Congenital absorption defect in small intestine proceeding to idiopathic steatorrhoea in adults.

C. *Pellagra Syndrome*—" ileocaecal inefficiency."

1. Primary Pellagra.
   Naturally occurring disease (absence of Vitamin B_2 complex).
2. Secondary Pellagra.
   Artificially produced disease-damage to ileum and mainly to large intestine by chronic bacillary or amoebic dysentery, alcohol and surgical interference.

This hypothesis is set forth in a somewhat crude and didactic manner as an attempt to stimulate further research. The means for doing so are at the present moment limited and it seems a favourable opportunity for impressing upon those more opportunely situated to pursue clinical observations and experiments on the lines suggested above. We have at present identified several factors and vitamins which appear to be concerned in these intricate processes and there are probably others equally important which remain to be discovered.

REFERENCES.

BAHR, P. H. (1915). A Report on Researches on Sprue in Ceylon 1912–1914.—155 pp. Cambridge: University Press. [7*s.* 6*d.*] [Reviewed in this *Bulletin*, 1915, **6**, 237–238.]

BECKH, W., ELLINGER, P. & SPIES, T. D. (1937). Porphyrinuria in Pellagra.—*Quarterly Jl. Med.* **6**, 305–319. [This *Bulletin*, 1938, **35**, 685–686.]

BENNETT, T. I. & HARDWICK, C. (1940). Chronic Jejuno-Ileal Insufficiency. Pathogenesis of Coeliac Disease, Tropical Sprue, and Other Conditions.—*Lancet*. **2**, Sept. 28, 381–384. [This *Bulletin*, 1941, **38**, 7.]

——, HUNTER, D. & VAUGHAN, J. M. (1932). Idiopathic Steatorrhoea (Gee's Disease); Nutritional Disturbance associated with Tetany, Osteomalacia and Anaemia.—*Quarterly Jl. Med.* **1**, 603–677. (661).

CHALMERS, J. N. M., GILLAM, A. E. & KENCH, J. E. (1940). Porphyrinuria in a Case of Industrial Methyl Chloride Poisoning.—*Lancet*, **2**, Dec. 28, 806–807.

ELDERS, C. (1917). Over de darmflora bij Indische spruw. Nederl. Vereeniging voor Tropische Geneeskunde.—*Nederl. Tijdschr. v. Geneesk.* 61 Jr., 1ste Helft, No. 15, 1253–1256.

FAIRLEY, N. H. & KILNER, T. P. (1931). Gastro-Jejuno-Colic Fistula, with Megalocytic Anaemia simulating Sprue.—*Lancet.* **2,** Dec. 19, 1335–1341. [This *Bulletin,* 1932, **29,** 463.]

—— & MACKIE, F. P. (1937). The Clinical and Biochemical Syndrome in Lymphadenoma and Allied Diseases involving the Mesenteric Lymph Glands.—*Brit. Med. Jl.* Feb. 20, 375–380. [This *Bulletin,* 1938, **35,** 53–54.]

HILLARY, H. (1766). Observations on the Changes of Air and Concomitant Epidemical Diseases in the Island of Barbadoes. 2nd Edition.—360 pp. London : L. Hawes, W. Clarke & R. Collins.

KETELAER, V. (1672). Commentarius medicus, de aphthis nostralibus, seu Belgarum sprouw. Leyden.

DE LANGEN, C. D. & LICHTENSTEIN, A. (1936). A Clinical Text-Book of Tropical Medicine.—pp. 557+xxxv (p. 487). Batavia-C-Surabaya-Amsterdam : G. Kolff & Co. [27*s.*] [Reviewed in this *Bulletin,* 1936, **33,** 161–163.]

MANSON, P. (1880). Notes on Sprue.—*China Imperial Customs, Med. Rept.* Shanghai. No. 19. **33–37.**

MANSON-BAHR, P. (1919). The Correlation of the Pathology and Bacteriology of Bacillary Dysentery. A Dissertation on Some of the Laboratory Problems arising in Connexion with this Disease in the Eastern Theatres of War.—*Jl. Roy. Army Med. Corps.* **33,** 117–138. [This *Bulletin,* 1919, **14,** 320–322.]

——. (1928). Sprue Indigenous to Nyasaland.—*Trans. Roy. Soc. Trop. Med. & Hyg.* **22,** 81–82. [This *Bulletin,* 1930, **27,** 346.]

——. (1929). On Non-Tropical or Indigenous Sprue.—*Jl. Trop. Med. & Hyg.* **32,** 118–119. [This *Bulletin,* 1930, **27,** 346–347.]

——. (1940). Glossitis and Vitamin-B_2 Complex in Pellagra, Sprue, and Allied States.—*Lancet,* **2,** Sept. 14 & 21, 317–320 ; 356–360. [This *Bulletin,* 1941, **38,** 7.]

—— & WILLOUGHBY, H. (1930). Studies on Sprue with Special Reference to Treatment. Based upon an Analysis of 200 Cases.—*Quarterly Jl. Med.* **23,** 411–442. [This *Bulletin,* 1930, **27,** 1017–1018.]

MILLER, R. (1933). Sprue commencing at 11½ Years of Age.—*Proc. Roy. Soc. Med.* 27, 113–114.

NICHOLLS, L. (1934). Sprue and Vitamin Deficiency.—*Ceylon. Jl. Sci.* (Sect. D. Med. Sci.). **3,** 173–176. [This *Bulletin,* 1936, **33,** 65.]

RAU, L. (1940). Acute Idiopathic Porphyry with Report of a Case.—*Lancet,* **2,** Nov. 23, 647–648.

DE RIVAS, D. (1930). [In Discussion of paper by BASSLER & LUTZ in *Jl. Amer. Med. Assoc.* **95,** 1961–1964. (1964). Sprue : Some Points on Etiology, Diagnosis, and Especially Treatment.] [This *Bulletin,* 1931, **28,** 660.]

SEBRELL, W. H. & BUTLER, R. E. (1939). Riboflavin Deficiency in Man (Ariboflavinosis).—*Public Health Rep.* **54,** 2121–2131.

SPIES, T. D. (1938). The Response of Pellagrins to Nicotinic Acid.—*Lancet,* **1,** Jan. 29, 252–253. [This *Bulletin,* 1938, **35,** 689.]

THAYSEN, T. E. H. (1932). Non-Tropical Sprue. A Study in Idiopathic Steatorrhoea.—258 pp. Copenhagen : Levin & Munksgaard. London : Humphrey Milford, Oxford University Press. [10*s.* paper ; 12*s.* 6*d.* cloth.] [Reviewed in this *Bulletin,* 1933, **30,** 57.]

——. (1935). Ten Cases of Idiopathic Steatorrhoea.—*Quarterly Jl. Med.* **4,** 359–395.

VAN DER BURG, C. L. (1880). Indische spruw. (Aphthae tropicae.) Eene monographie. Batavia : Ernst & Co. [Translation in *China Imperial Customs, Med. Rept.* Shanghai. No. 27. Oct.–Mar., 1883–84. pp. 55–85.]

SUMMARY OF RECENT ABSTRACTS.*

III. MALARIA.

Epidemiology.

A number of surveys have been reported, other than those dealt with more specifically in the text below. These are recorded for convenience, in tabular form :—

Author	Page	Place	Spleen rate	Parasite rate	Commonest infection	Commonest vector
			Per cent.	Per cent.		
Fratani	496	Beni Abbès	41	70·9	M.T.	—
Corradetti ...	452	S. Dancalia	—	9·8	M.T. B.T.	*A. gambiae*
Gilroy	52	Darjeeling	68	49	M.T.	*A. minimus*
Russell & Jacob	53	Madras	63·4	63·2	M.T.	*A. culicifacie*
Covell & Harbhagwan	740	Wynaad S. India	59–69	17–56 (seasonal)	M.T. B.T.	*A. fluviatilis*
Gunasekara ...	495	Ceylon	21·2	4·5	Q. M.T. B.T.	—
Crook	177	Szechwan	—	—	B.T. M.T.	*A. minimus*
Carr *et al.* ...	664	Cuba	white 10 negro 6·6	1·2 1·6	M.T. B.T.	*A. albimanus*
Earle *et al.* ...	178	Porto Rico	30–40	30–40	M.T. B.T.	—
Kumm & Ruiz	357	Costa Rica	0–40	—	Q. M.T. B.T.	*A. albimanus*

Vogel and Riou (p. 125) have given an account of malaria during 1937 in the French Colonies.

In Sardinia Piccaluga (p. 358) notes that gametocytes of *P. vivax* are commonly found in spring and summer, and that those of *P. falciparum* and *P. malariae* are more prevalent in autumn.

Mandekos (p. 183) discusses the general mortality in children in two areas of Macedonia where the parasite rate is usually high. The rate in children who harbour parasites is no higher than in those who do not ; it is probable that the former receive more medical attention. Infant mortality in malarious areas does not appear to be much influenced by economic status.

* The information from which this series of summaries has been compiled is given in the abstracts made by the Sectional Editors in the *Tropical Diseases Bulletin*, 1940, Vol. 37. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

Jakusheva (p. 451) shows that in the north of the U.S.S.R. the maximum incidence of malaria is in the spring and summer and that only one-third of the earlier cases are due to relapse, the remainder being primary infections with long latent periods. In the south, on the other hand, prolonged incubation is rare, and the maximum incidence is in summer and autumn, with a slight rise in spring due to relapses.

Writing of malaria in Abyssinia, Pansini (pp. 126, 452) states that the disease is very widespread, especially in the lowlands, but also at altitudes as high as 2,000 metres. Attacks occur in Italian workers in spite of prolonged quinine prophylaxis, and among the patients invalided back to Aversa from Abyssinia the author found that the infections were mainly due to *P. vivax*. In hyperendemic areas of Abyssinia, Corradetti (p. 358) shows that, in previously uninfected persons, *P. falciparum* infections predominate at first and that *P. vivax* appears later, though both are probably acquired at the same time. Malaria prevails in epidemic form from July to October, in which period is included the rainy season. He (p. 665) reports on malaria in the Uollo [or Wollo] Jeggiu region of Abyssinia, in which district is the town of Dessie at the junction of the road from Assab with the road from Asmara to Addis Ababa. Below 1,000 metres malaria is hyperendemic near permanent collections of water, but epidemics occur throughout the rainy season. Between 1,000 and 1,500 metres malaria is largely seasonal and may assume epidemic proportions; it is also seasonal between 1,500 and 2,000 metres. Above 2,000 metres no case of locally contracted malaria was seen. *A. gambiae* is the common vector and *P. falciparum* and *P. vivax* the most frequently found parasites. These observations were made on Italians only, thus eliminating factors which would have arisen had immune natives been considered. The majority of the Italians were employed on road construction. He further (p. 452) notes that in S. Dancalia, Abyssinia, malaria incidence is high during the dry season in the neighbourhood of perennial streams, and throughout the territory during the rains.

de Meillon and Gear (p. 739) report infection with *P. ovale* in S. Rhodesia, and Webb and Hervel (p. 739) record two cases in Mauritius.

Cros (p. 496) found a spleen rate of 50·75 per cent. in children in Madagascar, with but little difference between the flat, marshy coastal cantons and the hilly interior cantons.

Krishnan (p. 858) has studied the epidemiology of malaria in Bengal, where *A. philippinensis* is the carrier. It is possible to predict an epidemic on the basis of the amount of rain falling in the drier months of the year and on the relative incidence of *P. malariae* and *P. falciparum* in the drier months. If the latter predominates at that time, an epidemic in the later months (the normal malaria season) may be expected. Russell *et al.* (p. 782) report observations made on two areas in India; in one malaria transmission takes place throughout the year, in the other it is seasonal.

In Ceylon, Gunasekara (p. 495) reports that in the three zones defined as wet, intermediate and dry the parasite rates are 0·9, 5·5 and 7·7 per cent., and the spleen rates 4·9, 26·1 and 36·6 respectively during the period February–March, when the annual malaria recrudescence is declining. The investigations were made in school-children.

The Malaria Advisory Board of the F.M.S. (p. 284) record an increase in malaria in 1937 and suggest that the facilities offered by extensive replanting of rubber for the breeding of Anopheles played an important part in this respect.

FARINAUD and PROST (p. 494) state that in a district of Cambodia where the population is steadily diminishing malaria is chiefly responsible, that infants are all infected in the first year of life and that the infant mortality rate is 308 per 1,000. *Anopheles minimus* is ubiquitous. MONTEL and DO-VAN-HOANH (p. 599) report that in the native quarter of Saigon there is more malaria than is generally supposed. FARINAUD (p. 128) reports on malaria in Poulo-Condore, a small island off the coast of Cochin-China. Epidemics occur and there is frequent importation of fresh strains of infection. In two areas of the Tonking Delta MARNEFFE *et al.* (p. 355) show that outbreaks of malaria take place at the beginning of summer and towards the end of the year. During these outbreaks *P. falciparum* infections are as common as those of *P. vivax*, and pernicious attacks occur. The constant coolie traffic between these areas and areas of hyperendemic malaria is an important factor in maintaining infection. GENEVRAY *et al.* (p. 664) show that in Hanoi the amount of malaria is very small.

BISPHAM (p. 284) reports on malaria in the Southern United States, where in school-children 35 per cent. of the infections are with *P. falciparum*. The parasite rate varies between 4 and 9 per cent. FAUST (p. 178) discusses malaria in relation to life insurance in Southern United States.

In the province of Oriente, Cuba, malaria endemicity is low, but CARR *et al.* (p. 664) report that occasional epidemics occur. Malaria is almost confined to places below an altitude of 1,000 feet and is most prevalent in the Cauto River valley.

EARLE *et al.* (p. 178) report careful investigations on children, who rarely receive antimalarial drugs, in Porto Rico. Periodic examinations were made between 1931 and 1934. *P. falciparum* was most commonly found, but mixed infections were not rare. Often *P. vivax* infections were replaced by *P. falciparum*, the former reappearing when the latter had reached a low level. *P. falciparum* incidence was highest immediately following rises in mosquito density. Gametocytes of *P. vivax* were highest in the first week of infection, those of *P. falciparum* in the third week. Highest parasite counts and largest spleens were found within a few weeks of first infection. The authors believe that the onset of new infections can be determined and that each infection probably runs a definite course to a natural cure. EARLE (p. 495) has studied conditions in Porto Rico, where malaria, though present, is not hyperendemic. Local epidemics occur, the highest spleen rates are found between 10 and 20 years of age, malaria causes considerable illness at all ages and no special group is a source of mosquito infection. *P. vivax* causes most infections between 5 and 9 years, but *P. falciparum* predominates at later ages.

KUMM and RUIZ (p. 357) in Costa Rica found malaria almost confined to the Atlantic and Pacific seaboards, and rare at heights above 1,000 feet. Quartan infection is rather more common than benign or malignant tertian.

HERNAN MENDEZ (p. 856) has found *P. ovale* in Venezuela, where it has not hitherto been recorded.

Giglioli (p. 356) in British Guiana has compared groups of estates according to the spleen rates. A table of the findings may be constructed which shows correlation between the various factors recorded :—

Spleen rate	Under 5	5 to 30	Over 30
Births per 100 deaths ...	244	152	119
Infant mortality rate	113	155·9	170·9
Stillbirth rate	47	78	92

Accinelli Fernandez (p. 355) suggests that in plantations in Peru malaria should be regarded as an occupational hazard.

Aetiology.

Sergent *et al.* (p. 179) discuss the nomenclature of malaria parasites, adopting the names *P. vivax*, *P. malariae*, and *P. falciparum*, and for the avian parasite, *P. relictum* in place of *P. praecox*.

Raffaele (p. 285) has made a study of the formation of male gametocytes from the microgametocytes.

Field and Le Fleming (p. 739) have described the morphological features of *P. falciparum* in thick films.

Mosna (p. 55) shows that a Roman strain of *P. falciparum* was more virulent than an Ethiopian strain.

Basu (p. 55) found that crescents in the blood of patients infected with *P. falciparum* were not infective for *Anopheles stephensi* for the first 4 days of their appearance in the blood, or from the 27th to the 40th day. Between the 4th and 20th days they were highly infective.

van den Berghe and Kovacs (p. 129) found, in *P. falciparum* infections, that mature erythrocytes were much more frequently affected than reticulocytes. Kitchen (p. 179), however, found that *P. falciparum* is not consistent in its tendency to be associated with erythrocytes of any particular age. *P. malariae* is most usually found in the mature cells but *P. vivax* has a greater tendency to infect reticulocytes. In infections with *P. vivax* Vryonis (p. 360) found that ring forms occurred over a hundred times more frequently in reticulocytes than in mature erythrocytes. The explanation offered is that it is the stickiness of the reticulocytes which accounts for the frequency of their infection with *P. vivax* rings. During the early stages of infection there was a transient rise in the number of reticulocytes after each paroxysm.

Boyd (p. 739) finds that well fixed subspecific varieties of *P. vivax* and *P. falciparum* may be detected by immunological methods. These may show slight morphological differences, but it is not yet clear that such characters are fixed, and it is observed that a local strain of parasite may or may not be specially suitable for infecting the Anopheles with which it is closely associated in nature.

Young *et al.* (p. 783) describe detailed observations on the behaviour of a strain of *P. malariae* inoculated into a series of Negro

paretics. Two instances are given of the long persistence of *P. malariae* in the body. LESNÉ *et al.* (p. 362) quote the case of a man who had left the Cameroons 13 years before his blood was used, in Paris, for a transfusion for his child. NABARRO and EDWARD (p. 362) record a similar case in which the parent left Ceylon 12 years before his blood was used for the same purpose. In both cases the children developed malaria and *P. malariae* was found in the blood.

BOCK (p. 53) discusses *P. ovale* and on the basis of a study of 20 cases from the points of view of morphology, clinical phenomena and immunological findings, upholds the view that *P. ovale* should be regarded as a separate species.

Transmission.

HUTTON and SHUTE (p. 456) discuss the risk of transmitting malaria by blood transfusion. Persons who have lived in areas in which malaria is endemic should not be used as donors if others are available, but if they must be used, the risk of transmitting malaria may be much lessened if they take 10 grains of quinine regularly each week. Preserving blood at a low temperature does not destroy parasites.

The accidental transmission of malaria by means of syringes and other apparatus for injection has been investigated. BLACK (p. 789) found that glass tubing used in the administration of neoarsphenamine may be contaminated with blood in the process, and unless this tubing is changed for each patient infection may be carried over. In drug addicts CHUNG *et al.* (p. 789) show that intravenous injections of heroin are commonly given in the dens, and that no precautions as to sterility are taken. Crescents and ring forms of *P. falciparum* and gametocytes of *P. vivax* have been found in the residual fluid of syringes used in these dens.

BERTRAM and GORDON (p. 497) have devised an insectarium in which conditions of almost constant temperature and humidity may be maintained. GEBERT (p. 498) describes a small piece of apparatus for maintaining humidity in glass tubes in which mosquitoes are kept.

FROHNE (p. 181) has attempted the classification of ponds, in relation to the breeding of anophelines, by the Desmids present.

In experiments to measure the range of flight of Anopheles, VARGAS and FREIRE (p. 784) have found that the immersion of larvae in a solution of methylene blue ($\frac{1}{8}$ to $\frac{1}{4}$ part per mille) for 18 to 48 hours is sufficient to impart a definite blue colour to adults which develop from these larvae. After this immersion the larvae may be returned to their original breeding places.

ANDRÉ and TOUMANOFF (p. 287) show that since the opening of a hill resort near Hanoi there has been an influx of anophelines, due apparently to the growing traffic. They point out the necessity for the limitation of possible breeding places and for the treatment of gametocyte carriers before they are sent to this hill station.

SHUTE (p. 666) has shown that the salivary secretion of *A. maculipennis* causes agglutination of ingested blood, and that the position of oöcysts found in the stomach depends upon the position in which the mosquito rests after a blood meal. This does not apply to *Aëdes aegypti* infected with *P. gallinaceum*; the salivary secretion of *Aëdes aegypti* does not agglutinate blood.

LEESON (p. 453) shows that under controlled climatic conditions female *A. maculipennis*, var. *atroparvus*, live longer in high humidity

than in low, and at the highest humidity, 90 per cent., the mean life of females which had taken one blood meal was 8·3 days, and the maximum 14. CAMBOURNAC and HILL (p. 784) give a detailed account of the biology of *A. maculipennis* var. *atroparvus* in Portugal. Breeding takes place for the most part in the rice fields, which are flooded from May to September. The larvae can withstand fairly high water temperatures and are found in water the salinity of which lies between 50 and 130 mgm. per litre. Females do not usually hibernate in the relatively mild winter, but move into the open and feed during the warmer days. In June, larvae may number 400 per square metre in the rice fields. Sheds containing animals are preferred as shelters, but houses are invaded if the mosquitoes are numerous; feeding takes place in shelters, never in the open. Animal rather than human blood is preferred, but man is attacked if the mosquito density is high, and endemic malaria therefore fluctuates with mosquito density. WEYER (p. 738) discusses the transmission of malaria in East Friesland, where *A. maculipennis* var. *atroparvus* is the vector. He brings out the point that attics are attractive to this mosquito, so that the sleeping habits of the people, on the ground floor or in attics, has a bearing on transmission. New infections are most common in July and August.

BATES (p. 179) has investigated the mineral requirements of the larvae of races of *A. maculipennis*. ZVIAGINTZEV (p. 286) shows that the number of egg-layings of *A. maculipennis sacharovi* decreased with an increase in the salinity of the water, provided in the experiment, from 0 to 1·75 per cent. *A. m. maculipennis* showed no great preference either for fresh or saline water up to 1·5 per cent., but in 1·75 per cent. the egg-layings were much less. Some eggs of both species were laid in all concentrations up to 3 per cent., but eggs which hatched out in 2 or 3 per cent. saline produced larvae which died before reaching the second stage. LEWIS (p. 454) discusses the habits of the races of *A. maculipennis* found in Albania. *A. m. sacharovi* breeds chiefly in brackish water and is found near the coast. *A. m. typicus* lays eggs in many types of water; *subalpinus* and *messeae* show marked preference for marshes. *A. sacharovi* may be an efficient vector if transmission takes place in winter or early spring.

ZOTTA (p. 176) discusses the distribution of the races of *A. maculipennis* in Rumania, where malaria is very widespread. LEPŞI (p. 494) discusses *A. maculipennis* and malaria in Bessarabia. PRENDEL and SOMOV (p. 127) discuss the habits of *A. maculipennis* var. *atroparvus* and *messeae* in the Odessa region.

GELLER (p. 742) and BALCACHINA (p. 742) report on the mosquitoes of Kasakhstan, central Asia. MARKOVICH (p. 127) has studied the biology of *A. maculipennis*. The findings cannot be further abstracted.

FRATANI (p. 496) names the Anopheles found in a malarious area of Oran. LE GAONACH (p. 500) found *A. sergenti* breeding and transmitting malaria in Hoggar, a mountainous region of central Sahara. JOYEUX *et al.* (p. 286) report on the Anopheles of the French Sudan. In the rainy season *A. gambiae* and *A. funestus* are found throughout. *A. gambiae*, *A. pharoensis* and *A. coustani* are prevalent in the areas irrigated by the Niger, where malaria is particularly severe.

SICÉ *et al.* (p. 857) show that *A. gambiae* can breed in Marseilles during summer and point out the risk of its being brought there by aeroplane from Africa. *A. gambiae* appears to determine the malaria of the Uollo Jeggiu region of Abyssinia. CORRADETTI (pp. 358, 665)

states that below 1,000 metres the breeding is intense throughout the year near permanent collections of water, and during the rainy season breeding is ubiquitous. Between 1,000 and 1,500 metres breeding is scanty in the dry season, but in the rains it is intense, and epidemic malaria occurs. Malaria is transmitted up to 1,900 metres during the rains, but has not been seen above 2,000 metres. Although *A. gambiae* is much the most important vector, *A. pharoensis* may also transmit the disease. He (p. 793) also notes that *A. gambiae* is the vector in the Combolcia plain of Italian East Africa, where the malaria season is from September to December. In this rainy season the whole plain becomes in effect a mosquito-breeding marsh. In Mombasa, Wiseman *et al.* (p. 786) found *A. gambiae* larvae in artificial containers and in wells. Adults were more common in houses on the mainland than in those on the island, and considerable numbers are brought into the town by the trains. *A. funestus* is also present, but is not an important vector on the island.

de Meillon and Gear (p. 128) discuss certain cases of malaria which have recently been contracted on the Witwatersrand, an unusual occurrence. These were probably due to infected *A. gambiae* brought in by motor vehicles from known malarious areas, and although *A. gambiae* may breed near Johannesburg the chances of their becoming infected are small and they are not likely to survive winter conditions. The other anophelines of the district are all zoophilic in habit.

Adams (p. 788) has shown that in N. Rhodesia *A. funestus* can fly 4·5 miles down wind and 1·5 miles at an angle of 30° up wind. *A. gambiae* can travel 4·25 miles down wind and 1·5 miles at a right angle to wind. Efficient anti-larval measures carried out for half a mile from the edge of an inhabited area in a copper-mining township were insufficient to keep the mosquitoes away.

Pinto (p. 498) has found that *A. gambiae* which has invaded Brazil from West Africa corresponds to the type form and not to the variety *melas*. The most important breeding places are collections of sweet, stagnant, clear water exposed to sunlight and covered by aquatic vegetation, especially *Pistia stratiotes*. Infection was found in 1932 to attain the extremely high figure of 62 per cent. References are made to the pandemic of malaria which followed the introduction of *A. gambiae* into Brazil in 1928. Barber (p. 857) also discusses *A. gambiae* in Brazil, pointing out that although malaria was present there before this mosquito arrived, its advent was followed by an epidemic outburst. The seriousness of the position is stressed.

Russell and Mohan (p. 741) show that *A. stephensi* bred in the insectary may be used as a standard with which to compare other species in experimental infection work. In experiments with *A. stephensi*, Russell and Mohan (p. 359) show that the chemical character in the water in which the mosquito breeds has little or no influence on the susceptibility of adults to infection with *P. falciparum*. The same authors (p. 359) found that the race *mysorensis* was as susceptible as the type form to infection with *P. falciparum*.

In Delhi, Afridi *et al.* (p. 500) found that of Anopheles which gave a positive precipitin reaction for human or animal blood, only 1·6 per cent. *A. culicifacies* and 5 per cent. *A. stephensi* were positive for human blood. In neighbouring villages the percentage of mosquitoes containing human blood varied inversely with the proportion of cattle to the human population.

In part of the Madras Presidency, RUSSELL and JACOB (p. 53) point out that the breeding of anophelines takes place principally in the shallow wells or pits dug for the purpose of watering the casuarina trees which are grown for firewood. Malaria is very prevalent, and *A. culicifacies* is the principal vector. *A. culicifacies* is not, however, important in malaria transmission in Bengal, and KRISHNAN (p. 858) gives a possible explanation. The larvae are introduced each winter and early spring into canal water, but although the conditions of temperature and CO_2/O_2 ratio in the water are favourable, the relative atmospheric humidity is low and probably leads to the death of the adults. Later, when the atmosphere is suitable for adults, the breeding conditions become unfavourable, though they are suitable for *A. philippinensis*, which is responsible for transmission. He (p. 744) reports that the breeding of *A. philippinensis*, the malaria vector of the Burdwan district of Bengal, is favoured in tanks by a high ratio of CO_2 to O_2, and that larvae are never found in tanks containing many Euglena. It does not breed in rice fields.

In the Chilka Lake on the coast of Bengal, WHITE and ADHIKARI (p. 741) have found *A. sundaicus* breeding. This probably accounts for much that was obscure in the epidemiology of malaria in this region, though *A. annularis* and *A. aconitus* probably have an effect in maintaining some degree of malaria. The authors do not approve of the recommendation for closing the outlet of the lake during the dry season, and give the reasons for their views. In Bally, near Calcutta, ROY (p. 500) shows that *A. varuna* is a vector, but *A. sundaicus* is not important.

GILROY (p. 52) found that the only infected species in tea gardens near Darjeeling was *A. minimus*.

COVELL and HARBHAGWAN (p. 740) show that on the hilly plateau of Wynaad, S. India, where malaria is prevalent, *A. fluviatilis* is the only important vector. It is house-haunting and anthropophilic in habit and breeds in rice field drains and grassy streams.

VINOGRADSKAYA and TIMROT (p. 180) discuss the breeding of *A. superpictus* in the laboratory. In Quetta Cantonment DE BURCA (p. 56) found that *A. superpictus* was the commonest anopheline, though the nearest breeding place was $1\frac{1}{2}$ miles away.

STRICKLAND *et al.* (p. 859) found that *A. maculatus* from India, though as easily infected with Malayan plasmodia as *A. maculatus* from Malaya, are not easily infected in India. They conclude that the Indian plasmodia have lower infectivity than Malayan strains. WALLACE (p. 287) shows that *A. maculatus* can fly as far as $1\frac{3}{8}$ miles in search of food. The experiment was made in view of the fact that anti-larval measures confined to $\frac{1}{2}$ or $\frac{3}{4}$ mile radius frequently fail to prevent seasonal waves of malaria when breeding is intense. From an inland hilly estate in Malaya in which routine catching of Anopheles had been carried out for some years, and in which cattle had been kept in considerable numbers, the cattle were all removed in May 1938. WALLACE (p. 287) shows that this had little effect on the numbers of *A. maculatus* caught in the coolie lines, since in this part of Malaya this species is markedly anthropophilic. *A. hyrcanus*, however, practically disappeared after the removal of the cattle.

TOUMANOFF and CANET (p. 860) show that in Cochin-China *A. hyrcanus* var. *sinensis* has been found infected and point out the necessity of securing the animal deviation of such zoophilic species in addition to controlling the major vectors such as *A. minimus* and

A. jeyporiensis. MARNEFFE *et al.* (p. 355) report that the chief vector in the middle reaches of the Red River delta in Tonking is *A. hyrcanus* var. *sinensis* which here is anthropophilic in habit. Elsewhere in Indo-China it is of little importance. Anophelines are abundant but none of the important species is present, and the malaria is mild, diffuse and characterized by seasonal outbursts. HU (p. 181) has studied the house frequenting behaviour of *A. hyrcanus* var. *sinensis* in the Shanghai area. TOUMANOFF (p. 288) reports his observations on the fecundity and longevity of *A. hyrcanus* var. *sinensis* in Tonking.

On a malarious section of the China-Burmah highway ROBERTSON (p. 792) found *A. minimus* to be the chief vector, but *A. maculatus*, *A. jeyporiensis*, *A. culicifacies*, *A. hyrcanus* var. *sinensis* and *A. annularis* were also found to be infected.

VENHUIS (p. 667) describes a variety of *A. hyrcanus*, found in Java and Celebes, which he proposes provisionally to name *A. hyrcanus X*. It is a potent vector of malaria.

VENHUIS (p. 455) describes slight morphological differences between *A. barbirostris* from Celebes and from Java. He points out that in Java this species lives almost wild and is never infected, whereas the form seen in Celebes is a house frequenter and was infected to the extent of 13·3 per cent. He proposes the name *A. barbirostris* var. *vanus* for the Celebes form.

FARINAUD (p. 128) reports that the principal vectors in the island of Poulo-Condore, off the coast of Cochin-China, are *A. ludlowi* and *A. subpictus*, both of which breed in salt water.

BANG *et al.* (p. 742) have found a specimen of *A. walkeri* infected in nature in the Reelfoot Lake region of Tennessee and Kentucky.

HINMAN and HURLBUT (p. 788) show that in the Tennessee valley *A. quadrimaculatus* passes the winter solely as a hibernating female after insemination. They have found that shading of the breeding places is not likely to be an effective measure against this species. BOYD (p. 666) notes that there is substantial agreement between the rates of infection, determined by gland and stomach dissection, of *A. quadrimaculatus* infected with *P. vivax*, and finds no evidence that mosquitoes die of malaria infection while being incubated.

BOYD and EARLE (p. 288) show that *A. pseudopunctipennis* is much inferior to *A. quadrimaculatus* in its susceptibility to *P. falciparum* and that *A. quadrimaculatus* from Florida is more susceptible to Mexican than to Floridan strains of *P. falciparum*. DEL PONTE (p. 860), however, shows that *A. pseudopunctipennis* is the principal vector at La Mendieta in the Argentine.

STONE and REYNOLDS (p. 360) report evidence to suggest that eggs of *A. albimanus*, *A. tarsimaculatus* and *A. punctimacula* laid in seepage areas in Panama may hibernate through the dry season, provided the eggs are covered by leaves or grass, although these seepage areas do not receive water. The earth in such places retains some moisture although it is crumbly. Eggs found at the end of the dry season require 7 to 14 days for hatching, in place of the usual 24 to 48 hours. These findings may explain the sudden increase in the number of larvae found 7 to 10 days after the onset of the rains.

In Costa Rica KUMM and RUIZ (p. 357) found 15 species of Anopheles. *A. albimanus* was the most prevalent and is apparently the only vector; it flourishes in the lowlands where malaria is endemic and severe. CARR *et al.* (p. 664) state that *A. albimanus* is the only important vector in Oriente, Cuba.

Giglioli (p. 356) produces further evidence to incriminate *A. darlingi* as the only important vector in British Guiana. *A. tarsimaculatus* and *A. albitarsis*, which elsewhere are potent vectors are here of no importance.

Immunity.

Sinton (p. 56) gives a summary of present knowledge on the subject of immunity in malaria. There are two factors, antiparasitic and antitoxic; the defensive mechanism is (*a*) cellular, by means of the phagocytic macrophage system which acts at first in a non-specific and sluggish manner and which is later specific and active, and (*b*) humoral, probably in the nature of an opsonin. The author holds that natural resistance is present in a large proportion of the indigenous populations of highly malarious areas. The residual immunity left after *P. falciparum* infections is more fleeting than that after *P. vivax*; that following *P. ovale* appears to be the most durable.

Applying the findings obtained in studies of *P. knowlesi* infections of young, non-immune, *rhesus* monkeys, in which it was shown that the parasitic intensity and the duration of antigenic stimulation determine the degree and rate of acquisition of immunity, Sinton (p. 57) concludes that in man, when infection is but rarely acquired, treatment should aim at *radical* cure. When, however, exposure to infection is frequent and continued, treatment should aim only at *clinical* cure of the attack, and when exposure is to frequent infection but is only temporary, *clinical prophylaxis* with an appropriate drug is the method of choice.

Wilson (p. 182) gives the data found in a comparison of three regions of Tanganyika Territory. Spleen rates, parasite rates and parasite counts are quoted. In one district transmission is continuous and firm immunity is acquired after the age of childhood. Clinical treatment is therefore only necessary in childhood, and should not be intensive enough to interfere with the acquisition of immunity. In the other districts transmission is seasonal, immunity is only partial, attacks of malaria may occur at all ages and require treatment. It is pointed out that where transmission is seasonal the control of anophelines may be possible.

Farinaud and Prost (p. 289) give data on the spleen and parasite rates at all ages of two races of inhabitants of intensely malarious parts of South Indo-China. In one race all infants are infected, but spleen and parasite rates fall in adult life and the adults are healthy, having acquired immunity. In the other the spleen and parasite rates remain fairly constant and the former is high in adult life. Effective immunity is not acquired and the adults are sickly. The authors attribute this difference to racial factors [but on the information given this is by no means certain. The rates quoted in the first group are characteristic of hyperendemic malaria; those of the second group are characteristic of seasonally transmitted disease].

Schilling (pp. 366, 790) states that it is possible to inject about 100 schizonts or sporozoites of *P. vivax* in man without producing fever or parasites in the blood, and that therefore man has a fundamental resistance to malaria, which is not based upon premunition. Increased resistance against schizonts can, however, be obtained by repeated small inoculations, but resistance to schizonts does not protect against sporozoites, and if sporozoites are injected in small

non-infecting doses, the immunizing results are very small. The receptivity of different individuals varies greatly and is an important factor. Experimental results on volunteers are quoted. The object of the work is to explore the possibility of protective vaccination. [See also SHUTE below.]

From experimental work BOYD (p. 863) concludes that in persons bitten by heavily infected mosquitoes the chances of infection are high, the incubation period is short, the duration and severity of the clinical attack are great and the chances of relapse are considerable. With lightly infected mosquitoes these conditions are reversed.

SINTON *et al.* (p. 54) have studied 108 cases of primary infection with *P. ovale* in patients in England, most of whom had not previously been infected with malaria. Relapse occurred only once, but although there were differences in susceptibility to the pathogenic effects of infection there was no great natural resistance to the acquisition of infection. Prolonged primary latency, which is frequent in *P. vivax* infections, was not seen. The natural distribution of *P. ovale* is in Central Africa. They (p. 183) give details of experiments on which they conclude that *P. ovale* confers marked resistance to reinoculation with both homologous and heterologous strains.

As a result of a large number of experiments with *P. ovale*, SINTON (p. 497) concludes that the sporozoites have a greater power of developing and multiplying in the human body than have inoculated trophozoites of the same species. In reinoculations into patients who had already been infected with *P. ovale*, sporozoites were much more capable than trophozoites of provoking detectable infections. He (p. 667) has found that the immunity which follows *P. ovale* infections induced by sporozoites is more effective than that which follows infections induced by trophozoites [compare SCHILLING above]. He (p. 862) further shows that successive inoculations with *P. ovale* produce progressively higher degrees of resistance to subsequent reinoculation than does a single infection. The antitoxic element of the immunity appears to be developed more rapidly than the antiparasitic, though in the absence of renewed infection the latter appears to be more durable.

ROCCHI (p. 455) concludes from experimental work that malarial pigment possesses antigenic power.

Pathology.

WOINO-IASSENETZKY (p. 861) has studied the distribution of *P. falciparum* in the human body ; there is no uniformity in the distribution in the different organs. In fatal cases the parasites accumulate in the vessels of the brain, the adipose cellular tissue, the intestinal mucosa and the pancreas. Involvement of the nervous system does not depend on the number of parasites in the body, but when the number is very low coma is not likely to occur. Coma only occurs when infected red cells acquire the capacity of accumulating in the cerebral capillaries, and this takes place 20 to 24 hours after the appearance of the generation of parasites responsible for the condition and when the maturing ring forms disappear from the peripheral blood. Gametocytes are formed exclusively in the bone marrow and spleen.

FAIRLEY (p. 863) describes a case of haemolytic hypochromic anaemia associated with post-malarial splenomegaly of the Banti type. He suggests that the basis was escape into the blood of an intracellular

lytic enzyme from the R.E.S. rendered pathological by chronic malaria. SICAULT and MESSERLIN (p. 862) regard malaria as a parasitic reticulo-endotheliosis divisible into three stages: the first in which the condition is secondary to blood infection; the second in which there is loss of function of the R.E.S.; the third in which there is complete breakdown of the R.E.S. They describe types resembling splenic anaemia, Banti's syndrome and cirrhosis of the liver.

GREIG and NEIL (p. 361) show that the administration of quinine and plasmoquine co. in malaria produces an increase in the number of reticulocytes in the blood. They consider that quinine causes haemolysis followed by erythropoiesis, and this supports the view that quinine may be a factor in precipitating blackwater fever. Associated with the rise in reticulocytes there is a marked fall in haemoglobin, and the sedimentation rate, which rises during the fever, returns gradually to normal.

GIORDANO (p. 863) reports a case of coronary occlusion in which he believes malaria to have been the primary cause.

Discussing congenital infection with *P. vivax*, DAS GUPTA (p. 184) considers that the placental barrier is injured by chronic rather than acute infection.

Diagnosis and Clinical Findings.

HALAWANI and SOBKY (p. 864) describe a method of concentration of blood parasites in malaria and advocate its use in surveys. MIYAHARA (p. 600) has devised a rapid method of staining with Giemsa in which a warm solution of K_2CO_3 or Na_2CO_3 is used as the diluent. BOYÉ (p. 737) writes of the value of Stévenel's blue and eosin in the staining of malaria parasites. Details are given, and the stain is easily prepared.

WOLFF (p. 57) describes a buffer precipitation test for use in malaria. Serum is mixed with buffer solution at various *p*H values and positive results are shown by the development of cloudiness. The test gives results closely comparable with those of the Henry reaction. TRY (p. 501) found a number of positive Wassermann reactions in a series of cases of malaria in Tonking, and concludes that in places where malaria is endemic, syphilis should only be diagnosed after repeated tests and by more than one method. In discussion, however, MASSIAS claims that the proportion positive was no more than would be found in any other group of patients, and points out that trauma or another infection may reactivate a latent syphilitic condition.

STRICKLAND and BAIRD (p. 129) record malaria in 6 infants aged between 15 hours and 7 days.

SHUTE (p. 289) discusses the protracted incubation periods which may occur in *P. vivax* infection acquired naturally in England. The average period was 282 days, which approximates closely to the period of 263 days observed as the average between the initial attack and the first relapse in another group. He notes that if a large dose of atebrin is given immediately after the infective bite, the febrile attack will commonly not develop for 6 to 9 months. It is possible that latent infections are due to the inoculation of restricted numbers of healthy sporozoites [see also SCHILLING above].

MURGATROYD *et al.* (p. 129) record a case in which vaccination against yellow fever provoked a first attack of malaria (in which

P. ovale only was found) in a man who had left the tropics eight months previously. The long latent period may be regarded as a protracted incubation period, though in *P. ovale* infections there are no recorded cases of such prolonged incubation. In a case recorded by ROSENTHAL (p. 185), a latent *P. vivax* infection was activated by the injection of an autogenous vaccine.

GREIG and NEILL (p. 456) discuss the incubation period of malaria induced by injection of parasites. BOYD (p. 864) describes the characteristics of malaria induced by injection of trophozoites.

From a study of a large number of cases, NIKOLAJEV (p. 290) concludes that the longest duration of *P. vivax* infections is 27 months, of *P. falciparum* 20 months and of *P. malariae* 3 to 4 years. He discusses relapses in the three infections.

FONDÉ and FONDÉ (p. 502) discuss chronic malaria, of which two clinical types may be recognized, one non-reactive in which the defensive powers are exhausted, and one reactive. In the former, specific drugs should be used with caution and should be withheld if administration causes a fall in leucocytes.

JOELSAS (p. 600) discusses disturbances of the nervous system, both in the acute attack and after it, in malaria. He inclines to the opinion that exo-erythrocytic forms of the parasites may be concerned with neurological disturbances and with relapses. ROY (p. 291) records a case of subtertian malaria in which there was aphasia and unilateral paresis with severe haemorrhage from the bowel; the patient recovered on receiving quinine.

GINGOLD and FLORESCO (p. 130) describe two cases of acute malaria in which the symptoms simulated those of acute appendicitis, and discuss the differential diagnosis.

GHIZZETTI (p. 184) records a patient with malaria who had signs of advanced pernicious anaemia. Treatment with atebrin and plasmoquine produced a remarkable cure. LIVADAS *et al.* (p. 291) discuss the blood picture in malaria.

JAMES (p. 185) has treated 22 cases of malarial nephritis in the Solomon Islands and New Guinea. *P. malariae* was the most common parasite found. The mortality was higher when quinine was given by the mouth than when it was injected intramuscularly.

CASQUEIRO (p. 791) notes that post partum retraction of the uterus may be much delayed in malarial subjects, but that specific drugs rapidly rectify the condition.

KRISHNAN (p. 744) reports that in malaria there is a marked deficiency of vitamin C. During attacks of fever the excretion of ascorbic acid is increased. This condition is most marked in the poorer classes. LERICHE (p. 790) notes that gingivo-stomatitis in malaria usually responds to local treatment, but that if it is haemorrhagic in type, deficiency in vitamin C should be suspected.

GRIMES and LAVERGNE (p. 864), as a result of observations in a sanatorium in Madagascar, state that an attack of malaria is a serious complication of pulmonary tuberculosis, especially in patients with pneumothorax, in whom a large pleural effusion may occur.

Charles Wilcocks.

[*To be continued.*]

HELMINTHIASIS.

Précis of Abstracts in this Section.

Nematodes.—Hawking (p. 146) discusses the distribution of infection with *W. bancrofti* and *A. perstans* in Tanganyika Territory. Limiting factors are probably those which control the distribution of the vectors, but climate alone will not explain the differences. The clinical signs of *W. bancrofti* infection are given. He (p. 147) injected blood containing microfilariae of *W. bancrofti* into 4 persons apparently free from that infection, in order to determine if nocturnal periodicity is due to the presence of adult worms or not. Several animals were also injected and the results are given. In two men the embryos promptly disappeared, in the others they persisted, though in greatly reduced numbers in one, for 8–10 days. No periodicity could be observed, but the author considers the experiment to be inconclusive.

Hu (p. 148) in Shanghai found infective larvae of *W. bancrofti* in 21 of 29 *Culex vorax* fed upon a heavily infected patient, but noted that extensive chitinization of the infective larvae occurred, which may affect adversely the potential rôle of this species in transmission. He (p. 149) found that only one of 90 *C. bitaeniorhynchus* similarly fed harboured infective larvae, but reports (p. 149) that 20·9 per cent. of *Anopheles hyrcanus* var. *sinensis*, treated in the same way, contained infective larvae. Kobayasi (p. 149) describes in detail the development of *Mf. bancrofti* in the body of *Culex fatigans*. Yao *et al.* (p. 150) describe their work on the infection of *Phlebotomus chinensis* with microfilariae of *Wuchereria bancrofti*. Stages up to the post-sausage forms in the thoracic muscles were observed. *P. sergenti* var. *mongolensis* gave similar but not quite so favourable results.

Radaody-Ralarosy and Guidoni (p. 151) report the removal of an enlarged lymphatic vessel, containing an adult female *W. bancrofti*, from the groin of a patient.

Hawking (p. 151) discusses two cases of chyluria. In one the microfilariae in the blood were seen only at night, but in the urine only in the daytime. The significance of this is discussed. He (p. 151) has tested a number of chemical compounds for their activity against microfilariae *in vitro* and *in vivo*. Only arsenicals and tartar emetic were effective, and even then only in concentrations impossible in living animals.

Dassanayake (p. 152) found *Mf. malayi* and *Mf. bancrofti* in about equal numbers of people in Galle, where 10 per cent. of the population are infected.

Rao and Maplestone (p. 152) describe the adult male and female of *Mf. malayi*, and propose to name this worm *Wuchereria malayi* in accordance with the specific name given to the embryo by Brug.

Hodgkin and Poynton (p. 153) show that *Mansonia longipalpis* is the principal vector of *Mf. malayi* in the Federated Malay States. The injection of certain drugs, which are named, into the enlarged inguinal lymph glands and surrounding muscle is apparently effective in stopping febrile attacks, but caution is necessary in appraising these results.

McMahon (p. 154) found 51 per cent. of a sample of the population of the Kavirondo district of Kenya to be infected with *Onchocerca volvulus*. He discusses the habits and distribution of *Simulium neavei*,

the common vector. ANDERSON and LEHUCHER (p. 155) report onchocerciasis for the first time in Tunisia. Species of Simulium are present in the district. LEVY (p. 155) reports a case of bilateral keratitis and cyclitis attributed to *Onchocerca volvulus*.

SKRIABIN (p. 155) refers to "*Loa extraocularis*" infection in Russia.

DESPORTES (p. 155) identifies *Filaria conjunctivae*, recovered from a girl, with *Dirofilaria repens*.

STEFANOPOULO and DANIAUD (p. 156) show that complement fixation tests in which the antigens were obtained from *Dirofilaria immitis* were positive in patients cured of infection with *Dracunculus medinensis* for two months after cure. Intradermal reactions were positive for a longer period.

KUITUNEN-EKBAUM (p. 156) found 70 per cent. of a group of children in Toronto to be infected with *Enterobius vermicularis*. CHANCO and SORIANO (p. 156) found the infection rate in Manila to be 75·2 per cent. SAWITZ (p. 156) shows that the NIH swab method is better than others in the detection of infection, and that in Havana the infection rate in children is 74·3 per cent. D'ANTONI and SAWITZ (p. 156) found that treatment with tablets of gentian violet was more effective in eliminating infection with Enterobius than were efforts at prevention. The cure rate in children was 90 per cent.

CATRON (p. 157) found Trichinella infection in 14·7 per cent. of autopsies in Michigan. TERRY and WORK (p. 157) report a case of trichinosis with marked cardiac involvement; the symptoms had been mistaken for those of rheumatic fever. LYSTER (p. 158) reports the use of papain in digesting out Trichinella cysts for microscopic diagnosis and as a basis for antigen reactions. ANDES *et al.* (p. 158) show that the administration of tetrachlorethylene, given to several patients in the early stages of what appeared to be Trichinella infection, was followed by rapid cessation of symptoms. MCNAUGHT *et al.* (p. 159) found phenothiazine to be useless in trichinosis of rats.

LIE KIAN JOE (p. 159) records a case of autoinfection by Strongyloides. *C. W.*

HAWKING (Frank). **Distribution of Filariasis in Tanganyika Territory, East Africa.**—*Ann. Trop. Med. & Parasit.* 1940. Sept. 26. Vol. 34. No. 2. pp. 107–119. With 1 map. [23 refs.]

Filarial literature concerning the Territory and its surroundings is considered, and Hawking's own observations are given.

A great central band of Kenya and Tanganyika Territory about longitude 36°E. is apparently free from filariasis. The *W. bancrofti* infection lies along a coastal strip, including the islands of Pemba, Zanzibar and Mafia with other areas along the western part where the great lakes lie, and yet another in the central area east of the northern part of Lake Nyasa. The *A. perstans* infection is in the main distinct in locality, west and north of Lake Victoria, but in part mingled with the *W. bancrofti* infection, east of Lake Nyasa. These limitations are presumably the result of the climatic conditions, especially that of temperature that control the distribution of the insect vectors; but there is more in it than this for the Mwanza and Kampala regions have climates that differ but little, yet the *W. bancrofti* microfilaria rates are respectively 22·9 and 0, and those for *A. perstans* 0 and 46·7. *Mf. bancrofti* always showed periodicity.

The clinical signs classed as definitely due to Bancroftian filariasis are: lymphangitis (a single case) the recurrence of which, it is felt, cannot certainly be prevented; hydrocele (in 10 per cent.); elephantiasis (in 1·8 per cent.); hernia with or without hydrocele (in 2·9 per cent.). Hernia is associated with the infection presumably because the weight of a hydrocele or elephantoid scrotum pulls open the inguinal ring. Pyomyositis is fairly common, but of its connexion with filariasis there is no evidence. On account of its other possible causes chronic adenitis proved difficult so to associate; thickening of the spermatic cord presented the same difficulty. Hydrocele and elephantiasis were common, lymph scrotum and chyluria occurred in 6 and 2 of 271 cases tabled. Of 362 *Culex fatigans* collected in Dar-es-Salaam 22·3 per cent. were infected, 13·2 per cent. with thoracic forms (usually 1 or 2 in an insect), while 2 (0·6 per cent.) contained mature larvae. *Clayton Lane.*

HAWKING (Frank). **The Transference of *Microfilaria bancrofti* into Natural and Unnatural Hosts.**—*Ann. Trop. Med. & Parasit.* 1940. Sept. 26. Vol. 34. No. 2. pp. 121–129. [10 refs.]

"These experiments were undertaken in an attempt to decide whether the nocturnal periodicity of *Mf. bancrofti* is dependent upon the presence of the adult worms (as suggested by Lane) or not; it is considered that the results obtained are not conclusive."

After citration, blood containing microfilariae was injected into four persons who had none in the blood. In two the embryos promptly disappeared; one of them had a double hydrocele, Fairley's dirofilaria antigen gave an ambiguous result, and the number of microfilariae injected had corresponded to 157 per cc. of the estimated total blood volume; the second person came from an area where *W. bancrofti* seems absent, had no clinical suggestion of filariasis, gave an ambiguous antigen reaction and received microfilariae to the estimated amount of 126 per cc. of the total blood volume. In the two others 90 per cent. of the microfilariae disappeared promptly; the rest persisted for about 10 days in the third person, who had received them to the estimated amount of 126 per cc. of his blood, and who had an ambiguous antigen reaction, but they gave no definite evidence of periodicity; in the fourth person, who had a negative antigen reaction, and who received microfilariae to the estimated amount of 350 microfilariae per cc. of his blood, embryos persisted for more than 8 days, it being impossible to state whether periodicity persisted. When the microfilarial suspension was injected intravenously into mice to the calculated extent of 5,600 to 8,000 microfilariae to the cc., over 80 per cent. of the larvae disappeared within one hour, the rest diminished progressively to zero within 40 hours, showed no periodicity (though the sleeping and waking hours of their hosts could not be followed); and in some mice examined histologically larvae were found in the capillaries of the lungs, liver and especially of the kidney glomeruli, phagocytosis not being seen. A guineapig had injections equivalent to about 340 microfilaria in the cc. of its blood; an hour later they were estimated at about 20, the two on which the calculation was made being sheathed; about 12 hours later the guineapig was killed, and in about 200 cmm. of blood from venous and heart blood there was one sheathed microfilaria whose nuclei stained poorly and seemed granular. Into a monkey the injection

given was to the extent of 140 microfilariae to the cc. of its blood, n was ever found there, and there was none in 0·3 cc. of heart bl taken when it was killed 24 hours later. Microfilariae injec intraperitoneally into mice survived for as long as 7½ days, there accumulation of lymphocytes, monocytes and in one animal of en thelial cells, but rarely did cells adhere to embryos, and none of latter passed into the general circulation. After subcutaneous in tions of about 7,000 microfilariae into the ears of rabbits and abdominal wall of rats, none appeared in the blood, but solit microfilariae were found on scraping the under surface of the skin of injection sites when the animals were killed 11 to 33 hours later, th being no definite phagocytosis.

"It must be concluded, therefore, that the evidence of transfus experiments is indecisive; with a little forcing, the results obtained date can be made to fit either hypothesis." In planning future w " attention should be paid to the following points: (1) the possibility latent infection present in the recipient may be diminished by testing skin-reaction to *Dirofilarial* antigen; (2) the number of microfila injected should exceed one million; (3) the waking and sleeping hour the recipient, subsequent to the transfusion, should be carefully regulate."

C. L

Hu (Stephen M. K.). **Studies on the Susceptibility of Shangai Mosquitoes to Experimental Infection with *Wuchereria bancrofti* Cobbold. VII. *Culex vorax* Edwards.**—Reprinted from *Peking Natural History Bull.* 1938–39. Vol. 13. Pt. 4. pp. 287–22. [Henry Lester Institute of Medical Research Collected Papers 1939. Vol. 7. No. 16.]

"1. Of 29 *Culex vorax* experimentally fed on a heavy case of *Wuchereria bancrofti* infection in Shanghai, 21 were found wi infective filarial larvae, 1 with dead immature larvae and 7 we negative for the infection when they were dissected after the completion of the incubation period of the parasite.

"2. Of the 21 *Culex vorax* which were harboring infective filar larvae, 5 of them were also found with dead immature stages of filarial larvae which were more or less chitinized.

"3. Extensive chitinization of the infective larvae was fou in most of these *Culex vorax*. In only six of them were all the infec larvae unaffected by chitinization.

"4. The findings from these *Culex vorax* were quite similar those from a series of *Culex fuscanus*. Some of the infective lar were found to be affected by chitinous encapsulation while they w still alive in their mosquito host.

"5. The infective larvae in some batches of *Culex pipiens* v *pallens* and *Culex vagans* which were infected at the same time the filarial case as these *Culex vorax* were not found to be affec by chitinization.

"6. It appeared that the extensive chitinization of the infec larvae in *Culex vorax* might be likely to influence adversely to so extent the potential role that this species might play as a transmit of *Wuchereria bancrofti* in the Shanghai area."

Hu (Stephen M. K.). **Studies on the Susceptibility of Shanghai Mosquitoes to Experimental Infection with *Wuchereria bancrofti* Cobbold. VIII. *Culex bitaeniorhynchus* Giles.**—Reprinted from *Peking Natural History Bull.* 1939–40. Vol. 14. Pt. 1. pp. 15–22. [Henry Lester Institute of Medical Research Collected Papers 1939. Vol. 7. No. 17.]

"1. Of 90 *Culex bitaeniorhynchus* experimentally fed on a heavy case of *Wuchereria bancrofti* infection, 33 were found harboring filarial larvae.

"2. Although time was allowed for the filarial larvae to complete their course of development before the mosquitoes were dissected, only 1 of the *Culex bitaeniorhynchus* were found with infective larvae.

"3. The rest of the above 33 *Culex bitaeniorhynchus* were harboring only immature filarial larvae which were in most cases found to be dead in the mosquito at the time of dissection. The few immature larvae which were found to be alive in these mosquitoes did not appear likely to be able to complete their development to the infective stage.

"4. That the retardation of the development of most of these filarial larvae was not due to seasonal influences was indicated by the finding of infective larvae in some batches of *Culex pipiens* var. *pallens* and *Culex vagans* which were infected at the same time as the *Culex bitaeniorhynchus*."

Hu (Stephen M. K.). **Studies on the Susceptibility of Shanghai Mosquitoes to Experimental Infection with *Wuchereria bancrofti* Cobbold. IX. *Anopheles hyrcanus* var. *sinensis* Wiedemann.**—Reprinted from *Peking Natural History Bull.* 1939–40. Vol. 14. Pt. 2. pp. 83–97. [10 refs.] [Henry Lester Institute of Medical Research Collected Papers 1939. Vol. 7. No. 18.]

"1. Of 381 *Anopheles hyrcanus* var. *sinensis* fed on a heavy case of *Wuchereria bancrofti* infection and dissected after time had been allowed for the filarial larvae to complete their development to the infective stage, 80 (20·9 per cent.) were found with infective larvae. The average number of infective larvae per mosquito was 3·6.

"2. When some of the *Anopheles hyrcanus* var. *sinensis* were infected on the filarial case together with some *Culex pipiens* var. *pallens* and some *Culex vagans*, the latter species were found to average a higher percentage of positive infection as well as a larger number of infective larvae per mosquito.

"3. Of 87 *Anopheles hyrcanus* var. *sinensis* collected from a filarial house in Woosung, 4 (4·6 per cent.) were found with filarial larvae, whereas of 245 *Culex pipiens* var. *pallens* collected from this house at the same time, 42 (17·2 per cent.) were found with filarial larvae."

Kobayasi (Hidekazu). **On the Development of *Microfilaria bancrofti* in the Body of the Mosquito (*Culex fatigans*).**—*Acta Japonica Med. Trop.* Formosa. 1940. Mar. Vol. 2. No. 1. pp. 63–88. With 4 plates & 2 figs. [25 refs.]

"A study on the development of *Microfilaria bancrofti* in the mosquito *Culex quinquefasciatus* (*C. fatigans*) was carried out at a room temperature

between May and September, 1938. Mosquitoes used in the experiments were bred from larvae in the laboratory, the infected ones being kept in metal net cages, fixed on silicic jars filled with water and containing some water plants. The larvae cast off their sheaths in 2 to 6 hours after their passage to the stomach of the mosquito. They penetrate the wall of the stomach and migrate into the body cavity within 4 to 17 hours of infection, and shortly after settle down in the thoracic muscles. The larvae usually become mature at room temperature (22·8–32°C.) in 12 to 14 days from infection. Development of the larva can be divided into a embryonic and 3 larval stages by 2 moults. The anterior oesophagus is developed from the primordial cells situated immediately anterior to the nerve ring and the posterior one from the primordial cell group situated at the middle of the larva. These 2 primordial cell groups are joined together 4 to 5 days after infection. From the beginning of the 2nd moult, cells situated at the posterior end of the oesophagus begin to multiply and form the posterior portion of the posterior oesophagus or 3rd part of the oesophagus. The mid-intestine develops from the primordial cells situated at the rear portion of the primordial cells of the posterior oesophagus. The 4 G-cells are brought closer to each other, the G_1-cell divides into 2 cells and the cytoplasm of the G_1-cells fuses together. Liquefaction next occurs and from these changes the rectum is formed. The genital anlage develops from cells that lie on the ventral aspect of the middle portion of the larva, and has no relation with the G_1-cell. Two large oval cells containing numerous gross granules in their cytoplasm may be seen at the end of the 1st larval stage, situated in the ventral aspect of the mid-intestine. No mention of these 2 cells has been made by previous investigators, [but] judging from their shape, structure, position and development, [they] represent the gland cells. All the cells in the nuclear column lie along the longitudinal axis of the larva, with the exception of the above described primordial cells, and they represent the muscle cells that form the muscular layer of the body wall and the sphincters of the mid-intestine. Shortening and elongation of anatomically fixed points of the larva during its development in the mosquito take place chiefly in the portion between the posterior end of the oesophagus and the anus, followed by the portion between the excretory pore and the posterior end of the oesophagus. Changes in size in the remaining parts are rare."

YAO (Y. T.), WU (C. C.) & SUN (C. Jung). **Further Study on the Development of Microfilaria of *Wuchereria bancrofti* in Sandflies.**—*Far Eastern Assoc. Trop. Med. C.-R. Dixième Congrès Hanoi, 26 Nov.–2 Dec., 1938.* Vol. 2. pp. 755–771. With 6 figs.

The authors, in 1938, furnished a preliminary report on this subject [see this *Bulletin*, 1939, Vol. 36, p. 150] and now give a fuller account of much interesting experimental work. They bred *Phlebotomus chinensis* in the laboratory and allowed them to feed on three filarial patients of different degrees of infection, and dissection of them at intervals from ½ to 6½ days later showed developmental stages from exsheathed embryos of filaria in the abdominal cavity to post-sausage forms in the thoracic muscles. Similar results, but not quite so favourable, followed when laboratory bred *P. sergenti* var. *mongolensis* were allowed to feed on the same patients. A few (7) *P. kiangsuensis* fed on two patients with a lighter infection, and 7½ days later five had exsheathed microfilariae in the abdominal cavity and three showed them in the thoracic muscles, but further development was not observed. The number of these was too small for valid deduction but the indication was that *P. kiangsuensis* was not a suitable intermediate host.

H. E. S.

RADAODY-RALAROSY (P.) & GUIDONI (P.). Un cas d'abcès filarien à localisation inguinale chez un Antaimoro. [**A Filarial Abscess in the Groin of an Antaimoro.**]—*Bull. Soc. Path. Exot.* 1940. Apr. 10. Vol. 33. No. 4. pp. 292–295.

A hard tumour of the size of an almond at the opening of the left inguinal canal contained what seems to have been a female *W. bancrofti*. The man had detected the tumour five days earlier after an attack of high fever and shivering and came to hospital because it interfered with walking. These febrile attacks he had had for some years, each attack lasting about four days and being accompanied by itching urticaria-like patches in the lower limbs. Under local anaesthesia the easily isolated mass was removed, a pedicle which reached up into the iliac fossa having been tied and cut. On section the tumour is described as containing streptococcic pus. It seems to have been a dilated and hypertrophied lympathic vessel in which was a female *Wuchereria bancrofti* containing outstretched embryos, the contents of the other part of the genital tube being degenerate. It lay in a mass of leucocytes and fibrin, the inner part of the surrounding wall being necrotic. *C. L.*

HAWKING (Frank). **Two Cases of Chyluria.**—*Jl. Trop. Med. & Hyg.* 1940. Aug. 15. Vol. 43. No. 16. pp. 218–221. With 2 figs.

Of the two chyluria cases described, one passed chylous urine throughout the 24 hours and had no microfilariae in blood or urine ; the amount of fat in the urine was increased by giving butter liberally. Charts of the second show a microfilarial blood tide with its crest about 2 a.m. and with complete absence of larvae by day ; the urine showed a diurnal periodicity, microfilariae making their appearance about 6 a.m., reaching their greatest numbers about 6 p.m. after which these fell abruptly. The curves of protein and red cells were similarly timed, that of fat less closely so. As just noted the numbers of microfilariae in blood and urine give sharply dissimilar curves, those in the urine are usually 20 to 30 times greater than in the capillaries, judging by comparison of microfilarial and erythrocyte numbers in each. These facts point either to extensive destruction of the red cells in the urine or to something other than capillary haemorrhage bringing them there ; the latter view is strengthened by the observation that the leucocytes in the urine were all lymphocytes with no polymorphs. In this case the chyluria ceased spontaneously, a pointer to the difficulty of assessing the real significance of the various " cures " claimed. *C. L.*

HAWKING (Frank). **Chemotherapy of Filariasis** *in vivo* **and** *in vitro*.—*Jl. Trop. Med. & Hyg.* 1940. Aug. 1. Vol. 43. No. 15. pp. 204–207.

The following substances were administered to patients with filariae (*W. bancrofti*) : Fouadin, anthiomaline, tartar emetic, neoarsphenamine, acetylarsan, espundal, arsant, emetine, sulphanilamide, 4 : 4′-diamino-diphenyl-sulphone, glucoside. No filaricidal action could be demonstrated.

The *in vitro* experiments covered 35 substances tested upon *Mf. bancrofti* at 37°C. for 20 hours. Only the arsenicals and tartar emetic were effective, and even then only in concentrations greater than are possible in the blood of living animals. The advantages of *in vitro*

experiments are the testing of many substances in a short time, the possibility of grading filaricidal effects, and the elimination of risks to a patient. A minor disadvantage is the midnight hour at which the test has to be set up; the essential disadvantage is that [as may be the case with intestinal anthelmintics] the drug administered is not the actual anthelmintic but is turned into this by the body; or, as Hawking puts it, "many important compounds, *e.g.*, tryparsamide, Bayer 205, and sulphanilamide (to some extent) do not manifest *in vitro* their specific activities upon the organisms against which they are effective *in vivo*." He therefore regards the discovery of a laboratory animal, small, cheap and filaria-carrying, upon which drugs could be tested, as offering the most chances of success. "If a laboratory infestation, suitable for chemotherapeutic research were once made available, it would seem (judging by our experience with laboratory infections of trypanosomes, malaria and streptococci), that the discovery of a potent filaricidal substance would be only a matter of time." *C. L.*

DASSANAYAKE (W. L. P.). **Filariasis Survey in Galle Town.**—*Jl. Trop. Med. & Hyg.* 1940. May 15. Vol. 43. No. 10. pp. 133–135.

A survey including analysis of 150 clinical cases and a blood survey of 1,840 persons, about 5 per cent. of the population of the town.

Of the blood slides 10 per cent. had microfilariae, their rate varying locally from 1·3 to 23 per cent. Of 189 positive slides 98 contained *Mf. malayi* and 91 *Mf. bancrofti*. *Mansonia* species especially *M. uniformis* are reported as common in localities with the *Mf. malayi* infection, and *C. fatigans* in those with *Mf. bancrofti* type. *C. L.*

RAO (S. Sundar) & MAPLESTONE (P. A.). **The Adult of *Microfilaria malayi* Brug, 1927.**—*Indian Med. Gaz.* 1940. Mar. Vol. 75. No. 3. pp. 159–160. With 2 figs.

"This worm is practically identical with *W. bancrofti* in nearly all its characters. The females are quite indistinguishable.

"In the case of the males we have had the opportunity over the past few years of examining five or six adult male *W. bancrofti* and are quite satisfied that they possess nine pedunculated caudal papillae and narrow caudal alae, but there is a good deal of evidence that these structures show some variation. On account of the discrepancies in the description of the male *W. bancrofti*, which Maplestone (1929) discussed, it is probable that the present worm might be considered identical with it, but as we have had the opportunity of comparing the two side by side we are able to distinguish the difference in the tail papillae. Also, the spicules of the new species are of the same general characteristics, but when seen side by side it is obvious that those of the new species are much more delicate than those of *W. bancrofti* and they also lack the distinct transverse corrugations on the stout portion of the spicules seen in *W. bancrofti*.

"These differences are so slight that alone they might be considered insufficient on which to base a new species, but in addition to them there are the differences in the microfilariae which have been recognized for many years and the fact that the insect host appears to be always *Mansonioides annulifera* whereas *W. bancrofti* is known to develop chiefly in *Culex fatigans*. It is accordingly proposed to name the worm *Wuchereria malayi* n. sp. following the name given to the microfilaria by its discoverer."

[The valid name of this species has been *malayi* since BRUG so designated it on discovery of the microfilaria (Articles 25 and 27b of the Code of Zoological Nomenclature). The removal of the species

from the genus *Filaria*, in which BRUG placed it, to the genus *Wuchereria* has in no way affected the validity of BRUG's specific name ; *Filaria malayi* Brug, 1927, merely becomes *Wuchereria malayi* (Brug, 1927), or, when it is desirable to indicate the authors of the new combination, *Wuchereria malayi* (Brug, 1927) RAO and MAPLESTONE, 1940. No new species has been created ; it is still Brug's.] *C. L.*

FEDERATED MALAY STATES. ANNUAL REPORT OF THE INSTITUTE FOR MEDICAL RESEARCH FOR THE YEAR 1938.—**The Transmission of *Microfilaria malayi*.** pp. 64–68 [HODGKIN (E. P.)]. **Filariasis** pp. 80–85 [POYNTON (J. O.)].

" The essential factor for the efficient transmission of *Mf. malayi* is undoubtedly the presence of large numbers of *Mansonia*, principally *M. longipalpis*, which in turn is dependent on the proximity of extensive, uncultivated, fresh water swamps within which the larvae obtain their oxygen supply from the roots of trees. Other species of *Mansonia* play a part in transmission and, if present in sufficient numbers, might alone be responsible for endemic filariasis : such conditions have not, however, been encountered."

The number of *M. longipalpis* captured in two localities was 6,923, about three-quarters of the total bag of *Mansonia* and *Anopheles* species listed. The percentages of the two collections of *M. longipalpis* which were infected with *Microfilaria malayi* were 0·86 and 0·56 for immature, and 0·72 and 0·89 for mature forms. Two other *Mansonia* species were found infected, namely *M. indiana*, with 3 immature and 1 mature infection in 603 examinations, and *M. uniformis* with 5 immature and 1 mature infection in 1,287 insects. But the possible risk from the prevalent *M. longipalpis* is shown by its capacity for infection, for when deliberately fed on carriers its percentage of infection was 96·62, a rate not far from that of the relatively scarce *M. annulata*, *M. annulifera* and *M. uniformis*, but considerably above that of *M. indiana*. Again when 72 *M. longipalpis* and 259 *M. uniformis* were fed on *Macaca irus*, infected with a microfilaria identified as *Mf. malayi*, the respective infection rates were 79·2 and 84·2. Blood films from Malayans in several districts showed infection varying from 14 to over 50 per cent. As to treatment, the need of caution in appraisement is stressed, but the evidence is that injection of drugs into enlarged inguinal lymph glands and the surrounding muscle is effective in reducing or stopping febrile attacks and thus in slowing or arresting the development of elephantiasis. One report received has dealt with such injections of 1 cc. of 1 per cent. mercury cyanide, a second with anthiomaline and a third with intravenous " Mapharside " ; all reports are favourable though at present with insufficient detail. Fouadin was found to be very painful when injected into the glands. *C. L.*

MENON (M. A. U.). **A Description and Comparative Study of the Fourth Instar Larvae of *Mansonia* (*Mansonioides*) *uniformis* (Theobald), and *Mansonia* (*Mansonioides*) *annulifera* (Theobald), including a Synoptic Table for the Identification of the Larvae of the Indian Species of the Subgenus *Mansonioides* Theobald, 1907 (Diptera, Culicidae).**—*Jl. Malaria Inst. of India.* 1940. June. Vol. 3. No. 1. pp. 179–184. With 3 plates.

ROMITI (Cesare). **Note on Dr. Knott's Paper on Filariasis of the Testicle.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1940. Apr. 30. Vol. 33. No. 6. pp. 653–654. With 1 plate.

McMahon (J. P.). *Onchocerca volvulus* **and its Vector in the South Kavirondo Districts of Kenya.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1940. June 27. Vol. 34. No. 1. pp. 65–83. With 3 maps in text & 8 figs. on 2 plates. [12 refs.]

The author recalls that *O. volvulus* infection was found in 1938 in the Kavirondo district of Kenya. He now records the results of a preliminary investigation of part of the S. Kavirondo district. The altitude varies between 4,000 and 5,000 feet and the area is well watered by two rivers. The climate is equable, with an average rainfall of about 60 inches. The population is dense, and consists of the Luo (Nilotic) and the Kisii (Bantu) tribes. The daily vocations of the people constantly bring them into close contact with the rivers. It is interesting to note that one section of the population left an endemic area for fear of contracting the disease. Skin snips of 605 people (men, women and children) were examined; 309 (51 per cent.) were positive for *O. volvulus*. The general adult rate (60 per cent.) is, as one might expect, higher than the rate in childhood (43 per cent.) and the male rate is higher than the female. Children may become infected at the age of 4 years or earlier, but unfortunately children in arms were not available for examination.

Adult Simulium were collected in the bush along the rivers, and pupae in all parts of the rivers. A total of 1,369 female flies was collected and with the exception of one specimen of *S. dentulosum* Roubaud, all were *S. neavei*. The density of fly varied with density of bush and with shade and the resulting humidity, but food supplies must, of course, constitute an attraction. The author dissected 557 flies and recorded the results as positive or negative, 49 were positive; no attempt was made to ascertain the seat of infection, whether proboscis, thorax or stomach. Highest infectivity rates were found in lowest fly densities. When the fly migrates to comparatively open country it is much more closely in contact with human population and consequently is more liable to become infected, but as a rule the flies are reluctant to leave the dense riverine bush. In the upper reaches of one of the rivers only two flies were caught, but both were infected with *O. volvulus*, owing probably to the close contact with human population.

In regions of high fly density a high incidence of human onchocerciasis was found to exist and in regions of low fly density a corresponding drop in the degree of infection was evident. The region of lowest infection was at a point, 1½ miles from the river, where the people draw their domestic water supply from a small sunlit stream, and where the country is free from bush.

It was found that dense thicket was not attractive to the flies, but that on a dull day they will travel to a maximum of 700 yards from their breeding grounds through light bush. Shade, as one would expect, was made use of by the flies. No single Simulium adult fly was found inside the huts.

S. neavei were released into cages containing rabbits, guineapigs, and rats for the purpose of infecting these animals. All the flies were apparently reluctant to feed as they were always seen to be resting on the sides of the cages.

A survey of the rivers and tributaries resulted in the finding of larvae and pupae of 8 species of Simulium but not those of *S. neavei* in spite of the fact that this was by far the commonest adult found.

Frances G. Wilcocks.

Anderson (C.) & Lehucher (P.). Premier cas d'onchocercose cutanée observé en Tunisie. [**The First Case of Cutaneous Onchocerca Infection seen in Tunisia.**]—*Arch. Inst. Pasteur de Tunis.* 1940. Mar. Vol. 29. No. 1. pp. 105–112. With 3 figs.

This report of Onchocerca infection comes from La Goulette, a small fishing village in Tunisia. The observations date from 1926. For preliminary note see this *Bulletin*, 1939, Vol. 36, p. 155.

A lad of 15 had skin irritation at night and had had for 4 years a tumour as big as a nut [noix : ? walnut] on the right thenar eminence. It was cut out and found to consist of two distinct masses each as big as a chick pea and, on teasing out, there were present here and there coiling filaments and, in the connective tissue, microfilariae 300 μ long by 6 to 7 μ wide without sheath or dart. The worm had a white thick striated cuticle and some bits had annular thickenings. The lad had been inland at Ain-Draham and Tabarka on occasions. Simulium has been found, variously identified as *S. lineatum* and *S. reptans*. The irrigation arrangements are figured, and that of an onchocerca nodule perhaps refers to this case, although the paper deals also generally with the infection. *C. L.*

Levy (A. H.). **A Case of Bilateral Keratitis and Cyclitis due to Filaria** (*Onchocerca volvulus*) **Infection in a European from Kenya.**—*Proc. Roy. Soc. Med.* 1939. Oct. Vol. 32. No. 12. pp. 1620–1621 (Sect. Ophthalmology pp. 80–81).

The patient had lived in the Kakamega district of Kenya for ten years, was seen in 1937 with conjunctivitis and a high eosinophilia and in 1939 with keratitis and cyclitis. He had no nodules, and frequent and careful examinations with the slit lamp showed no microfilariae. Atropine drops and hot bathing relieved the symptoms.

C. L.

Skriabin (K.). Invasions à filariides chez l'homme en l'URSS. [**Human Filariasis in U.S.S.R.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1940. Vol. 9. No. 1–2. [In Russian pp. 119–127. With 4 figs. [14 refs.] French summary p. 127.]

"*Loa extraocularis*" has been recorded 8 times in the U.S.S.R., infection always being by an immature female, man being evidently a non-optimum host. Study is needed to determine its optimum host. *C. L.*

Desportes (C.). *Filaria conjunctivae* Addario 1885, parasite accidentel de l'homme, est un *Dirofilaria*. [*F. conjunctivae* **an Accidental Parasite of Man is a** *Dirofilaria*.]—*Ann. Parasit. Humaine et Comparée.* 1939–1940. Vol. 17. Nos. 5 & 6. pp. 380–404 ; 515–532. With 5 figs. [Bibliography.]

The material came from a tumour the size of a hazel nut in the left submammary groove of a Corsican girl of 14. The worm, 116 mm. long and 0·47 mm. wide, is pictured and identified as a *Dirofilaria*. Twenty-three species of the genus are considered and 19 are grouped, though not designated as subgenera, *Filaria conjunctivae*, with which this specimen is identified, being placed in the group containing *D. repens*. *C. L.*

STEFANOPOULO (G. J.) & DANIAUD (J.). Réaction de fixation du complément et intradermo-réaction au cours de la filariose humaine à *Dr. medinensis*. [**Complement Fixation and Intradermal Reactions in Infection with** *D. medinensis*.]—*Bull. Soc. Path. Exot.* 1940. Mar. 13. Vol. 33. No. 3. pp. 149–153. With 5 figs. on 2 plates. [13 refs.]

These reactions were positive for one to two months after cure. The antigen was obtained from *Dirofilaria immitis*. The table covers ten persons and shows that complement fixation was classed as +++ for two months after cure, by four months it was ——+ and after that either the same or ———. The intradermal reaction was positive, in the seven cases in which it was tested, up to 8 months after cure. Eosinophilia in seven cases tested lay between 4 and 32; the gel test, made in five cases, was clear in two, opaque in two and doubtfully clear in one. There were no microfilariae in the blood. Nearly all the patients came from the French Niger where other filariases are practically absent. *C. L.*

KUITUNEN-EKBAUM (E.). **The Incidence of Enterobiasis in Children in a Convalescent Home in Toronto.**—*Canadian Public Health Jl.* 1940. June. Vol. 31. No. 6. pp. 287–290.

"In the I.O.D.E. Preventorium Convalescent Home 140 children, 2 to 14 years of age, were examined for *Enterobius vermicularis*. The NIH swab, with 3·7 swabs taken per child, disclosed 98 children or 70 per cent. of those examined, positive for enterobiasis."

CHANCO (Pedro P.), Jr. & SORIANO (Lily J.). **The Incidence of** *Enterobius vermicularis* **among Filipino School Children: a Preliminary Report.**—*Acta Med. Philippina.* Manila. 1939. July–Sept. Vol. 1. No. 1. pp. 81–89. [14 refs.]

"The incidence of enterobius vermicularis parasitism among Filipino school children in a district of Manila (Paco District) with the use of the cellophane-swab method is given as 75·2 per cent."

SAWITZ (Willi). **Comparison of Methods used in the Diagnosis of Oxyuriasis.**—*Rev. Med. Trop. y Parasit.* Habana. 1940. Mar.–Apr. Vol. 6. No. 2. pp. 75–78. With 1 fig.

The report deals with 482 children at 6 Charity Homes examined by means of the NIH swab. Of them 358 (74·3 per cent.) in all were found positive for enterobius. A single NIH swab examination detected 65·9 per cent. and showed superiorities of 165 to 1 over direct faecal film, of 4·6 to 1 over brine centrifugal floatation, and of 4·2 to 1 over zinc sulphate centrifugal floatation. Additional swab examinations raised the positive percentages to the following figures: second examination to 79·9, third to 87·2, fourth to 90·2, fifth to 93·9, sixth to 98, seventh to 99·4. Zinc sulphate floatation gave 2 more and raised the percentage to 100. *C. L.*

D'ANTONI (Joseph S.) & SAWITZ (Willi). **The Treatment of Oxyuriasis.**—*Amer. Jl. Trop. Med.* 1940. May. Vol. 20. No. 3. pp. 377–383. With 2 figs.

A study undertaken to determine the efficacy of gentian violet in ridding children of threadworms in three institutions in New Orleans.

Diagnosis was by the NIH swab, freedom from infection being admitted only when seven consecutive examinations had been negative. Treatment was by half-grain tablets of gentian violet of a kind said to dissolve in the caecum.

One institution with 58 inmates showed 38 per cent. of infections. After 6 weeks of rigid hygienic measures in this institution, already scrupulously clean, infection had increased 13 per cent. These measures were :

" Two extra housemaids cleaned every room with hot soap and water daily ; the children wore short cotton pants during the night, these shorts being changed and sterilized daily ; bed sheets were changed and sterilized daily ; underwear was changed daily and sent to the laundry ; nail brushes were provided for each child and their use enforced ; two showers were taken daily instead of one."

In the other two institutions 97 per cent. of 122 boys and 81 per cent. of 26 girls were found infected. The treatment was from 0·5 grains 3 times a day to courses of 1 grain 3 times a day for 5 to 8 days with repetitions of courses. Cure rate was 90 per cent. Vomiting was prevalent, but did not follow actual dosing. Treatment has, then, proved more satisfactory than efforts at prevention. *C. L.*

Catron (Lloyd). **The Incidence of Trichinosis in 300 Autopsies at the University Hospital, Ann Arbor, Michigan.**—*Amer. Jl. Hyg.* 1940. July. Vol. 32. No. 1. Sect. D. pp. 12–23. [34 refs.]

In these 300 routine autopsies the percentage of Trichinella infection was 14·7. None of them had given a history suggestive of the infection.

All the 44 infections were disclosed on digestion of 50 gm. or less of diaphragm by pepsin and hydrochloric acid, 8 when the amount of muscle was 1 gm., 3 when a single squash preparation of ground up diaphragmatic muscle was microscopically examined. While such digestion showed up all persons in whom infection was detected, it was useless in estimating the weight of infection since in this process dead and calcified measles are dissolved. *C. L.*

Terry (L. L.) & Work (J. L.). **Trichinosis of the Myocardium. Report of a Case, with Autopsy Findings.**—*Amer. Heart Jl.* 1940. Apr. Vol. 19. pp. 478–485. With 4 illustrations.

A rapidly fatal case of trichinosis with myocardial involvement was mistaken for rheumatic fever.

This woman of 20 came to hospital unable to walk for pain and swelling in feet and ankles having, as it transpired later, eaten uncooked smoked ham shortly before her illness began, while earlier in the illness she had had a generalized itching eruption. In the blood the red cells numbered 4,180,000, white cells 15,800, eosinophils 1 per cent., haemoglobin 12·5 gm. (Sahli) ; blood could be got from a puncture wound for 45 minutes and she had purpura. "An electrocardiogram which was taken on the sixth hospital day revealed low voltage of the Q.R.S. complexes in all three conventional leads. The T-waves were barely visible ; in fact they were definitely identified in Lead II only. The P-R interval was 0·28 second." The temperature reached 40·5°C. She died on the 8th day after admission to hospital, the 28th day of her illness. After death the pectorals showed numerous larvae between and within hyalinized muscle fibres with reticulo-endothelial cell

surrounds. The heart muscle fibres were fragmented with focal necroses surrounded in a few by cell masses, in several showing half coiled embryos. " Pectoral muscle from the patient which had been preserved in 10 per cent. formalin for two weeks was digested and about 250 larvae obtained from 10 gm. of tissue. Except for the blocks saved for microscopic study, the entire heart, which also had been fixed, was similarly examined, but no parasites were found."

C. L.

LYSTER (L. L.). **On the Use of Commercial Papain for the Digestion of Trichinosed Meat.**—*Canadian Jl. Comp. Med.* Gardenvale, Quebec. 1940. Mar. Vol. 4. No. 3. pp. 73–75.

Commercial papain was found satisfactory in digesting out Trichinella cysts for microscopic diagnosis and as a basis for antigen reactions.

The condition needed for satisfactory digestion is the use of 0·1 gm. of papain in 313 cc. of normal saline to digest 100 gm. of tissue. Digestion is complete in 38 hours though some free larvae are seen in 24 hours. For antigen skin reaction there were compared coca extracts, prepared by Bachman's method [this *Bulletin*, 1929, Vol. 26, p. 551], of larvae secured by peptic and by papain digestion. On pig's skin both gave uncertain results, on that of man the reactions were identical with that of the accepted antigen. In precipitin tests the papain extract gave definite but less pronounced reactions than did the pepsin extract.

C. L.

ANDES (Jerome E.), GREENE (Robert A.) & BREAZEALE (Edward L.). **Early Mild Infestation with the Parasite *Trichinella spiralis*. Report of Ten Cases.**—*Jl. Amer. Med. Assoc.* 1940. June 8. Vol. 114. No. 23. pp. 2271–2275.

Tetrachlorethylene was given in the earlier days of their illnesses to persons suffering from what had the appearance of an epidemic of trichinosis. It merits note that this treatment stopped symptoms.

" 1. Of ten patients believed to have been infested with Trichinella spiralis, all but one gave a history of eating pork from one to three days before the onset.

" 2. The condition of eight of these patients was diagnosed within the first three days of the onset. The most common symptoms were malaise, abdominal discomfort, fever, headache, and edema around the eyes. All showed a definite eosinophilia and all tested gave a positive skin reaction with trichinella antigen. Administration of tetrachlorethylene was followed by complete and immediate recovery.

" 3. The two patients consulting us six and seven days after the onset contracted muscle pain and tenderness; patient 3 showed a fairly long drawn out convalescence.

" 4. The eosinophil content of the blood was shown to rise continually during the day, being highest in the evening."

C. L.

[The patients were connected with a University and would have reported any recrudescence of symptoms. They were re-examined at periods varying from 6 days to 5½ weeks after completion of treatment, except in the case of one man, but were then found to be healthy. The authors do not claim that the drug cured the condition, though it may have done so, they merely record the cessation of symptoms.—*Ed.*]

McNaught (James B.), Beard (Rodney R.) & DeEds (Floyd). **Further Observations of Phenothiazine in Experimental Trichinosis.** —*Proc. Soc. Experim. Biol. & Med.* 1939. Nov. Vol. 42. No. 2. pp. 645–648.

Further experiment [see this *Bulletin*, 1940, Vol. 37, p. 309] has shown that phenothiazine has no value in the control of experimental trichinosis in rats. There seems to be a sex variation in susceptibility to trichinosis, female rats being more resistant than the males.

C. L.

Lie Kian Joe. Autoinfectie bij Strongyloidiasis als vermoedelijke doodsoorzaak. [**Autoinfection with Strongyloides as a probable Cause of Death.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1940. Oct. 22. Vol. 80. No. 43. pp. 2550–2553. English summary.

"A case of hyperinfection with Strongyloides in a Japanese fisherman. Tremendous numbers of rhabditiform larvae in freshly obtained duodenal contents and vomited material and a certain number of filariform larvae besides. In the stools rhabditiform larvae in enormous quantities. The size of the filariform larvae from the stomach and duodenum (seen by direct observation) was equal to the size of the filariform larvae obtained by culture from the faeces. For this reason they cannot be explained as larvae, which had already passed the lung. Permission for autopsy could not be obtained."

RABIES.

A REVIEW OF RECENT ARTICLES. XXXIV.*

i. *Virus.*

A strain of rabies virus isolated from a jackal has been examined by Veeraraghavan and Philipsz and has been found to be pathogenic for domestic fowls. In the original fowl passage the incubation period was 29 days, whereas after 15 passages it remained fixed at 2 days. Negri bodies, at first numerous, became greatly reduced in number and in size. This fixed strain was highly pathogenic to rabbits and guinea-pigs. On the other hand fowls inoculated with the strain of Paris fixed virus which is used in India, developed rabies only after very protracted incubations (8 and 11 months). A brief description of the Negri bodies is appended.

The comparative susceptibility of 10 different strains of mice to rabies virus has been examined by Johnson and Leach[2]. Two strains of virus were employed, one of human origin which had been passed intracerebrally through 5 mice, the other from a dog which had

* For the thirty-third of this series see this *Bulletin* 1940, Vol. 37, p. 614.

[1] Veeraraghavan (N.) & Philipsz (G. L. C.). The Susceptibility of Domestic Fowls to a Strain of Rabies Virus obtained from a Jackal.—*Indian Jl. Med. Res.* 1940. July. Vol. 28. No. 1. pp. 81–90. With 2 plates.

[2] Johnson (Harald N.) & Leach (Charles N.). Comparative Susceptibility of Different Strains of Mice to Rabies Virus.—*Amer. Jl. Hyg.* 1940. Sept. Vol. 32. No. 2. Sect. B. pp. 38–45. [10 refs.]

exhibited symptoms of furious rabies. No essential differences were observed between the various mice strains.

CASALS[3] shows that younger mice (7–9 days) are more susceptible than older mice to fixed or street virus administered by any route: that 20-day-old mice are more susceptible than 60-day-old mice to peripheral, but not intracerebral, injection of fixed virus: that 20- and 60-day-old mice are equally susceptible to street virus. "Our own experiments indicate that age differences in susceptibility to street virus are not specially noteworthy but do develop with fixed virus which has been passed artificially from animal to animal."

The influence of water vapour on dried rabies virus has been investigated by REMLINGER and BAILLY[4]. It appears that whereas the dry powder preserves its virulence over a period of many months, when the least trace of water vapour is present loss takes place in a few weeks. They believe that loss of virulence is due not to a combined action of heat, oxygen and desiccation, but to the action of some proteolytic property which acts only in the presence of water.

A "fatal bovine pruritic syndrome" which resembles pseudo-rabies has on rare occasions been observed in Illinois (U.S.A.). GRAHAM, MORRILL and BOLEY[5] now report that they have isolated a filterable virus from the brain of a steer which exhibited symptoms of this complaint. Inoculation experiments with both unfiltered and filtered virus induced the appropriate symptoms in guineapigs; the virus grew on the chorio-allantoic membrane of the chick. Cross immunity tests were conducted by SHOPE and supported the deduction that the virus was that of pseudo-rabies.

ii. *Diagnosis.*

Various points in the diagnosis of rabies by inoculation of mice are discussed by WILLETT and SULKIN[6]. From comparative experiments they found that the white mouse is more susceptible to rabies virus than is the guineapig. Thus of 104 white mice 10 (9·3 per cent.) survived, whilst of 54 guineapigs 24 (44·4 per cent.) survived. Also the average incubation period in the mice was 13·6 days, whereas in the guineapigs it was 18·4 days. It seemed that Swiss mice did not differ materially from mice belonging to a stock which originated in St. Louis. The authors consider that the demonstration of Negri bodies in the inoculated animal is essential for a positive diagnosis. They find that the bodies appear in the mouse's brain before the 8th day, and that for rapid diagnosis the animal may be sacrificed at this period. They recommend ether in 10 per cent. concentration for the sterilization of contaminated brains.

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[3] CASALS (J.). Influence of Age Factors on Susceptibility of Mice to Rabies Virus.—*Jl. Experim. Med.* 1940. Oct. 1. Vol. 72. No. 4. pp. 445–451. With 2 figs.

[4] REMLINGER (Paul) & BAILLY (Jacques). Influence de la vapeur d'eau sur l'activité des poudres de virus rabique.—*C. R. Acad. Sci.* 1940. May 6. Vol. 210. No. 19. pp. 683–684.

[5] GRAHAM (Robert), MORRILL (C. C.) & BOLEY (L. E.). Bovine Pseudorabies or "Mad Itch" Virus.—*Science.* 1940. June 28. Vol. 91. No. 2374. pp. 623–624.

[6] WILLETT (Joseph C.) & SULKIN (S. Edward). Improved Methods in the Diagnosis of Rabies.—*J. Amer. Vet. Med. Assoc.* 1939. Dec. Vol. 95. No. 753. pp. 659–662. With 4 figs.

Using Mallory's stain, BLACK[7] finds that adjustment of the *p*H of the eosin to 3, and buffering the methylene blue to a *p*H of 5 improves the method. He was able to demonstrate Negri bodies in a greater percentage of cases (which had been proved to contain virus by Webster's mouse test) than when the ordinary reagents were used. He discusses the nature of the Negri body, and states that " the small Negri body containing a single internal basophilic granule, the intranuclear inclusion of poliomyelitis and the nucleoli of certain neuroglia cells particularly in small animals are identical in size, shape, contour, staining reaction and granular content. Nucleoli of certain neuroglia cells are frequently confused with small Negri bodies, particularly in smear preparations. Evidence indicates that many so-called virus inclusions are actually metabolic responses of the nucleus and are not degenerative products of the cell. The special staining methods do not show that the Negri body is a degenerative product of the cell."

iii. *Pathology.*

The distribution of the rabies virus in the brain of a 55-year-old man, who died of rabies two months after a bite on the hand has been examined by SABIN and RUCHMAN.[8] The virus was not found at the site of the bite, but was present in appreciable amounts in the cervical cord and medulla, the cornu ammonis, and the olfactory bulbs. The patient had received no treatment.

iv. *Methods of Treatment and Statistics.*

It will be remembered [this *Bulletin*, 1935, Vol. 32, p. 607] that SANKARAN and BEER found that ultra-violet rays from a quartz mercury vapour lamp inactivated rabies virus, and that they stated that experiments were in progress to determine whether the inactivated virus retained its antigenic properties. The reviewer is unaware of the results of these experiments, but the lacuna is now filled up by HODES, WEBSTER and LAVIN[9]. They find that tissue culture rabies virus loses its virulence under the action of ultra-violet rays from a quartz mercury vapour lamp (as also from a mercury resonance lamp), thus confirming the result of SANKARAN and BEER ; and further, from experiments relating to 60 treated and 21 untreated mice, that a considerable degree of protection can be attained from culture virus vaccine which has been irradiated for 35 minutes.

The mouse test of WEBSTER for determining the immunizing power of anti-rabies vaccines has been referred to on many occasions in these reviews. Those interested will find in the Public Health Reports, an excellent and thorough *résumé* by HABEL[10] of the experiments which have been carried out in America by WEBSTER and his collaborators.

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[7] BLACK (Charles E.). Interpretations of Neurotropic Virus Cell Inclusions, with Special Reference to the Negri Body.—*Jl. Infect. Dis.* 1940. July–Aug. Vol. 67. No. 1. pp. 42–47. With 5 figs. [19 refs.]

[8] SABIN (Albert B.) & RUCHMAN (Isaac). Spread of Virus in an Unvaccinated Case of Human Rabies.—*Proc. Soc. Experim. Biol. & Med.* 1940. June. Vol. 44. No. 2. pp. 572–577.

[9] HODES (H. L.), WEBSTER (L. T.) & LAVIN (G. I.). The Use of Ultraviolet Light in preparing a Non-Virulent Antirabies Vaccine.—*Jl. Experim. Med.* 1940. Oct. 1. Vol. 72. No. 4. pp. 437–444. With 1 fig.

[10] HABEL (Karl). Evaluation of a Mouse Test for the Standardization of the Immunizing Power of Anti-Rabies Vaccines.—*Public Health Rep.* 1940. Aug. 16. Vol. 55. No. 33. pp. 1473–1487. [10 refs.]

The influence of age on the immunizability of mice to rabies virus has been examined by CASALS[11]. It appears from his experiments that mice more than 60 days old are more readily immunizable than mice less than 20 days of age. "The titre of circulating neutralizing antibodies does not parallel the titre of immunity."

A dog test for measuring the immunizing potency of vaccines after the pattern of the mouse test previously described by WEBSTER has been examined by WEBSTER and CASALS[12]. The infecting dose was given into the muscles of the neck, and the animals were young beagle dogs. There was a strong parallelism between the results in dogs and in those previously reported in mice. The best results were obtained from chloroform vaccines administered intraperitoneally.

Experiments on the protective power of various vaccines have been carried out by DODERO[13]. The general results are as follows. In the case of pre-infectional immunization, treatment by dried cords protected 72 to 86·6 per cent. of rabbits, treatment by phenol vaccine (5 per cent. incubated 24 hours at 37°C.) protected 42 to 69 per cent., and treatment by formol vaccine (incubated for 5 days at 37°C.) protected 66 to 86·6 per cent. In the case of post-infectional treatment, dried cord vaccine protected 30 to 50 per cent., phenol vaccine protected 15 per cent., and formol vaccine afforded no protection. [The data are not in a form from which statistical inferences can be drawn.]

A series of experiments on the immunizing properties of 31 strains of fixed virus, 28 of which are now in use for the manufacture of rabies vaccine in America and other countries, has been carried out by HABEL[14]. Twenty-five of these were derived from the original Pasteur strain, others were isolated in Budapest, Texas, the Rockefeller Institute and Alabama. "The immunizing potency of strains seemed to be related to their ability to resist phenol, to the rapidity of their passage transfer, and possibly to the length of the incubation period in rabbits." It was not related to the degree of removal from street virus, resistance to glycerine, or to the species of animal through which it was transmitted. "The need of establishing a strain of high immunogenic value for use in manufacturing rabies vaccines for human and animal use is obvious." Work directed towards the determination of how to build up and maintain the immunizing value of a fixed rabies virus strain is in progress and will be published at a later date.

A series of tests has been carried out by WYCKOFF and BECK[15], with the object of testing the conclusions arrived at by WEBSTER [this *Bulletin*, 1940, Vol. 37, pp. 194 and 619] with regard to the immunizing

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[11] CASALS (J.). Influence of Age Factors on Immunizability of Mice to Rabies Virus.—*Jl. Experim. Med.* 1940. Oct. 1. Vol. 72. No. 4. pp. 453–461. With 1 fig.

[12] WEBSTER (Leslie T.) & CASALS (J.). A Dog Test for measuring the Immunizing Potency of Antirabies Vaccines.—*Jl. Experim. Med.* 1940. May 1. Vol. 71. No. 5. pp. 719–730. With 1 plate.

[13] DODERO (J.). Valeur expérimentale pour le lapin de quelques vaccins antirabiques.—*Far Eastern Assoc. Trop. Med. C.-R. Dixième Congrès Hanoi, 26 Nov.–2 Dec., 1938.* Vol. 2. pp. 373–384.

[14] HABEL (Karl). Factors influencing the Efficacy of Phenolized Rabies Vaccines. I. Strains of Fixed Virus.—*Public Health Rep.* 1940. Sept. 6. Vol. 55. No. 36. pp. 1619–1631. With 4 figs. [17 refs.]

[15] WYCKOFF (Ralph W. G.) & BECK (C. E.). The Potency of Anti-Rabic Vaccines.—*Jl. Immunology.* 1940. July. Vol. 39. No. 1. pp. 17–23.

potencies of various antirabic vaccines now in the American market. "On the whole our results agree well with those published by WEBSTER. Both suggest that much of the vaccine now being sold has little antigenic value, and both demonstrate the variation that exists in different batches of a single manufacturer." The results are based upon the WEBSTER mouse test.

With the object of testing the truth of VAN STOCKUM'S assertion [this *Bulletin*, 1935, Vol. 32, p. 612] that the success of treatment can be assessed by the comparative absence of deaths with incubation periods greater than 30 days, BOECKER[16] analyses the statistics relating to 151 cases of rabies in European persons who had *not* received treatment. These occurred in Germany during the years 1895–1933, and may be distributed as follows :—

Duration in days from infection to death.

	0–33	33–34	34–63	64–93	94–123	124–153	153	Total
Head and neck	11	2	24	5	1	0	2	45
Hand and arm	12	3	26	16	9	0	4	70
Body and leg...	1	0	7	7	3	0	0	18
No record ...	1	1	7	6	3	0	0	18
Total ...	25	6	64	34	16	0	6	151
Percentage ...	16·5	4	42	22·5	11	0	4	100

In the second forthcoming section of this communication Boecker intends to analyse the statistics of persons treated during the same period and under similar conditions. The author discusses results arrived at by other workers, but the interest lies chiefly in the above table, and in the corresponding table regarding treated persons, which he promises.

The history of antirabic vaccination in Turkey is described by BAECHER.[17] The first director was ZOEROS PASHA, and treatment was inaugurated by him in 1892. It will be remembered that REMLINGER carried out much of his earlier work in Constantinople, as director during the years 1896 to 1911. The method of treatment originally employed was that of Pasteur. In 1917 that of Hogyes was introduced, and in 1938 this was replaced in certain Turkish institutes by that of Semple.

A statistical summary of antirabies treatment at the Pasteur Institute at Vienna from 1927 to 1938 is presented by PIRINGER[18]. The statistics are discussed under the headings adopted at the Paris Conference. During the earlier years the method of treatment was

[16] BOECKER (Eduard). Inkubationszeiten und Lebensfristen bei der menschlichen Tollwut und ihre Auswertung bei der Beurteilung von Wutschutzbehandlungsverfahren. I. Mitteilung.—*Ztschr. f. Hyg. u. Infektionskr.* 1940. Apr. 7. Vol. 122. No. 4. pp. 387–405.

[17] BAECHER (Stephan). Die Wutschutzimpfung in der Türkei.—*Türkische Ztschr. f. Hyg. u. Experim. Biol.* Ankara. 1940. Vol. 2. No. 1. pp. 93–102. [Turkish version pp. 85–92.]

[18] PIRINGER (W.) Bericht der staatlichen Schutzimpfungsanstalt gegen Wut in Wien für die Ziet vom. 1.I.1927 bis 31.XII. 1938.—*Wien. Klin. Woch.* 1940. Feb. 23. Vol. 53. No. 8. pp. 151–158.

that of Hogyes, but in May 1938, after the occurrence of two cases of post-vaccinal paralysis, the method was changed to that of SEMPLE. [We note with regret mention of the death of Dr. Bruno BUSSON, a careful worker and philosophic thinker whose thoughtful communications have from time to time been reviewed in this *Bulletin*.]

The annual report of the Department of Health of Palestine contains a summary by STUART[19] of antirabic treatment during the year 1938. An interesting map shows that treatment is now available at 38 centres scattered from Acre and Safad in Galilee to Gaza and Beersheba in the south, with a central Laboratory at Jerusalem and district laboratories at Haifa and Jaffa. Of 1,376 persons bitten and exposed to risk two developed the disease. "Only one case of neuro-paralytic accident, in 1937, has been recorded in the last 6 years, *i.e.* 1 in 10,690 treatments."

v. *Rabies in Animals.*

GEIGER[20], reports a case of rabies in a dog, which developed the disease 109 days after it had been bitten.

"Rabies has been eradicated from the British Isles, why not here?" This problem is discussed by FLYNN[21] of Kansas City in a paper presented to veterinary surgeons in America. He deals with the diagnosis of the disease, both clinical and experimental, the various methods of dog control, and the employment of prophylactic vaccination, and concludes "by joint effort, by perseverance, by improving our methods where possible, by vigorous action through ourselves as individuals and through our elected representatives and officers, we shall succeed and rabies will then cease to be a menace."

An outbreak of rabies in Ontario (Canada) is reported by CAMERON[22]. Nine dogs, one cat, and 3 cattle were affected, and 60 persons received Pasteurian treatment. Methods of control are discussed.

A proprietary vaccine (the nature of which is not given) has been tested on monkeys by WEBSTER, MCGUIRE, STEPHENS and LAHIRI[23], and been found unavailing. The authors recommend a 6 per cent. sheep's brain carbolized vaccine in seven daily subcutaneous doses of 5 cc. each.

A large scale experiment on the efficiency of a single injection (5 cc.) of a phenol vaccine in protecting dogs from a subsequent intramuscular dose of street virus has been carried out by LEACH and JOHNSON[24]. Of 105 dogs so vaccinated 24·8 per cent. (26 animals)

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[19] PALESTINE: DEPARTMENT OF HEALTH. ANNUAL REPORT FOR THE YEAR 1938 [HERON (G. W.), Director of Medical Services]. Section viii. Laboratory Services. [STUART (G.), Deputy Director (Labs.)]. pp. 112–115, 125–127 & map facing p. 104.—Anti-Rabies (Pasteur) Institutes.

[20] PUBLIC HEALTH REPORTS. 1940. Aug. 23. Vol. 55. No. 34. pp. 1540–1541.—Incubation Period of Rabies in Dogs [GEIGER (J. C.).]

[21] FLYNN (J. C.). The Control of Rabies.—*Jl. Amer. Vet. Med. Assoc.* 1940. May. Vol. 96. No. 758. pp. 642–648.

[22] CAMERON (A. E.). Rabies Infection.—*Canadian Public Health Jl.* 1940. Sept. Vol. 31. No. 9. pp. 424–427.

[23] WEBSTER (W. J.), MCGUIRE (J. P.), STEPHENS (E. D.) & LAHIRI (B. N.). Prophylactic Anti-Rabic Vaccine for Animals.—*Indian Med. Gaz.* 1940. June. Vol. 75. No. 6. p. 349.

[24] LEACH (Charles N.) & JOHNSON (Harald N.). Canine Rabies Vaccination. An Experimental Study of the Efficacy of the Single Subcutaneous Injection Method with Phenol treated Vaccine.—*Amer. Jl. Hyg.* 1940. Sept. Vol. 32. No. 2. Sect. B. pp. 46–53. [13 refs.]

died of rabies, whereas of 120 untreated controls 55 per cent. (66 animals) contracted the disease. As this is a significant result the authors conclude that a single dose of a phenol-treated vaccine "affords some protection against subsequent experimental exposure to rabies street virus."

vi. *Miscellaneous.*

An omnibus communication dealing with (1) difficulties in the diagnosis of rabies in the dog; (2) the question as to whether patients licked on the unbroken skin should or should not receive treatment; (3) isolation *versus* destruction of dogs suspected to be rabid; and (4) rabies in the mongoose and in the bat is presented by Greval and Nicholas[25]. *A. G. McKendrick.*

[25] Greval (S. D. S.) & Nicholas (M. J.). Common Cold Responsible for Grave Suspicion of Rabies in the Dog and a Discussion on Associated Considerations including Rabies in Mongooses and Bats.—*Indian Med. Gaz.* 1940. July. Vol. 75. No. 7. pp. 401–404. [17 refs.]

VENOMS AND ANTIVENENES.

Précis of Abstracts in this Section.

Flecker (p. 166) discusses snake bite in tropical Queensland, pointing out that there is much inaccurate information published on the subject and urging closer co-operation between medical men and ambulance attendants.

Fidler *et al.* (p. 166) have studied the histopathology of monkeys after subcutaneous injections of Crotalus venom. The venom is a powerful tissue irritant and some degree of shock is probably produced. Takahasi (p. 167) describes the effects of the venom of *Enhydris plumbea* of Formosa. In animals the central nervous system is affected and there is local haemorrhage at the point of injection. There is also action on motor nerve endings and on muscle. The poison glands are small and the venom only weakly toxic; the snake is therefore to be classed as intermediate between the poisonous and non-poisonous snakes. Le Gac and Lepesme (p. 167) describe the effects of the bite of *Dendraspis jamesoni*, commonly known as the mamba. One of the authors was bitten on the ankle and within a few minutes paresis, which affected the intercostals, developed in spite of a tourniquet. Oedema of the leg appeared later. The patient recovered. Phisalix (p. 167) points out that the injection apparatus of Dendraspis is very efficient, resembling in this respect that of the Viperidae, though the venom is that of the Colubridae.

Kellaway and Trethewie (p. 168) discuss the electrocardiographic changes in the rabbit after intravenous injection of cobra venom and show that adenyl compounds are liberated from perfused liver, kidney and heart of the rabbit after cobra venom injection and after lysocithin.

Taborda (p. 169) draws attention to the necessity for constant conditions in experiments concerned with the clotting of blood by snake venoms, and mentions some of the variables encountered.

Taylor (p. 170) discusses the standardization of cobra antivenene.

Chowhan (p. 170) discusses cobra and viper venom in the treatment of epilepsy.

Fossen (p. 170) records two fatal cases of bite by a sea snake; in each there was haemoglobinuria and swelling of the parotid, and in one there was paresis of the muscles of the head and extremities.

Barros (p. 171) gives a detailed list of the symptoms of scorpion sting; the general symptoms are the result of damage to the hypothalamus, the vasomotôr centres and the vagel centres. The sole effective treatment in severe cases is the injection of serum. Sergent (p. 172) shows that certain popularly-held ideas about scorpions in Algeria are untrue. *C. W.*

Flecker (H.). **Snake Bite in Practice.**—*Med. Jl. Australia.* 1940. July 6. 27th Year. Vol. 2. No. 1. pp. 8–13.

The author gives an account of the study of incidence of snake bite in tropical Queensland, and points out that trivial and unimportant cases form the vast majority of those reported. Very little interest is shown in the identity of the reptiles, and the author hopes this will be remedied; in certain instances it is not even certain that a patient admitted to hospital for snake bite has, in fact, been bitten.

The author gives details of bite by identified and unidentified, non-venomous and venomous snakes, including some which were fatal. The dangerous snakes mentioned are the death adder *Acanthophis antarcticus*, the taipan *Oxyuranus scutellatus*, and the brown snake *Demansia textilis*.

The principal burden of this paper is the need for closer co-operation between medical attendants and ambulance stations, at which the patients are usually first seen, and the realization that the figures given in official returns are misleading. *Frances G. Wilcocks.*

Fidler (Herbert K.), Glasgow (Richard D.) & Carmichael (Emmett B.). **Pathological Changes produced by the Subcutaneous Injection of Rattlesnake (Crotalus) Venom into *Macaca mulatta* Monkeys.**—*Amer. Jl. Path.* 1940. May. Vol. 16. No. 3. pp. 355–364. With 4 figs. on 2 plates. [11 refs.]

Accounts of the histopathology of lesions in man caused by the bite of the rattlesnake are rare. The authors gave subcutaneous injections of Crotalus venom (1 per cent. solution in saline) to 9 *Macaca mulatta* monkeys, the doses varying from 7 to 10 mgm. per kilo. body weight. Death occurred at an average of 36·5 hours after injection. The principal lesion was marked haemorrhagic oedema at the site of injection, spreading extensively through the adjacent subcutaneous tissues. Necrotic changes in the walls of the small blood vessels were found and in the surrounding exudate were red blood cells with some leucocytes. Ante mortem thrombi were present. The regional lymph glands were swollen and haemorrhagic, with dilated sinuses. There were haemorrhages in the sub-endocardial tissues; in the liver and kidneys only slight changes were seen.

The venom is therefore a powerful tissue irritant causing necrosis, and absorption takes place into the lymph stream mainly from the advancing edge of the haemorrhagic lesion. Shock is the most probable cause of death in animals (reported by other workers) which have been given intravenous injections of venom, but the evidence is not so clear for those given subcutaneous injections, although the

subcutaneous loss of blood and fluid was in these experiments sufficiently extensive to be considered capable of producing some degree of shock. *C. W.*

Takahasi (Yosibumi). Morphologische und Pharmakologische Grundlage von *Enhydris plumbea* (Boie) als eine Art Giftschlange. [**Study of *Enhydris plumbea* as a Poisonous Snake.**]—*Acta Japonica Med. Trop.* 1940. Mar. Vol. 2. No. 1. pp. 89–103. With 6 figs. [13 refs.]

Enhydris plumbea is a Formosan snake generally regarded as non-poisonous. The author, however, found poison glands connected with fangs. He describes the naked-eye and microscopic features of the poison apparatus. The bite is not very serious for human beings, partly because the amount of venom injected is small, partly because the toxic content is in low proportion, and partly because the toxicity of the venom is slight compared with that of *Ancistrodon acutus*, *Trimeresurus gramineus* and *T. mucrosquamatus*, whose venom that of *E. plumbea* resembles in kind but not in degree. The author was bitten on three occasions ; on one no ill results followed, on the others there was redness and oedema from 1·3 to 2·5 cm. in diameter, with unpleasant dull aching pain, and on the third occasion suppuration occurred, a small abscess 0·8 cm. in diameter forming, which was healed in a fortnight.

The action of the poison was tested on mice, rabbits and frogs. Mice were killed with symptoms of central nervous system paralysis and, in particular, of the respiratory centre. Injection led to marked subcutaneous haemorrhage and considerable oedema. On excised heart muscle of the frog the action resembles that of digitalis, but, if in large amounts, mild paralysis results. On the blood vessels of the frog (hinder limbs) and rabbit (ear) strong vasoconstriction succeeds transient dilatation. In rabbits the effect on respiration is to deepen and amplify the breathing ; this lasts for some considerable time and only when the dose is large does this effect give place to paralysis and arrest of respiration. Similar stimulant, followed by depressant and paralytic, effects are produced by the venom on smooth muscle. Studies on nerve muscle preparations of the frog indicate that the poison acts mainly on the motor nerve endings and, to a less extent, on the muscle itself.

From the smallness of the poison glands, the incompletely developed poison fangs and the weak toxicity of the secretion *Enhydris plumbea* is to be classed as intermediate between the poisonous and non-poisonous snakes. *H. H. S.*

Le Gac (P.) & Lepesme (P.). Sur un cas d'envenimation non mortel par morsure de *Dendraspis* (Colubridé protéroglyphe). [**A Case of Non-Fatal Bite by Dendraspis.**]—*Bull. Soc. Path. Exot.* 1940. Apr. 10. Vol. 33. No. 4. pp. 256–258.

Phisalix (M.). Quelques remarques sur la fréquence des effets rapidement mortels des morsures de Colubridés protéroglyphes appartenant au genre africain *Dendraspis*, Schleg. [**Comments on the Frequency of Rapidly Fatal Bites of Dendraspis.**]—*Ibid.* pp. 258–259.

i. The bite of Dendraspis is usually rapidly fatal and polyvalent serum is regarded as ineffective ; there has not yet been prepared a

specific serum. The snakes of this genus, commonly known as mambas, belong to the Proteroglypha sub-family of the family Colubridae and are akin to the genus Naja. Four species are known in Africa :— *D. viridis* (W. Africa), *D. jamesoni* (W. and Central Africa), *D. angusticeps* (Central and S. Africa), and *D. antinorii* (Abyssinia).

One of the authors, Lepesme, was bitten on the ankle by a mamba, *D. jamesoni*, which he was attempting to capture on a tennis court in the town of Bangui. The snake measured 1·57 metres in length. In spite of a tourniquet applied immediately, symptoms of paralysis began to appear in less than one minute, and he was taken at once to hospital. Within 30 seconds of the bite there was commencing numbness of the tongue leading to difficulty in speaking ; in three or four minutes the limbs were similarly affected and paresis was marked. At the moment of arrival in hospital, seven minutes after the bite, the patient was rigid and almost speechless. There was tachycardia, small rapid pulse, difficulty of respiration, but in spite of this effect on the nervous system the patient was perfectly conscious. An immediate injection of 40 cc. antiserum AO (anti-Bitis and Sepedon) was given together with caffeine, ether and camphor in oil. There was intense general pain and difficulty in breathing owing to paresis of the intercostal muscles. The tourniquet was released after 1½ hours and this was followed by painful bilious vomiting which appeared slightly to relieve the general condition, but which persisted throughout the afternoon and night. The following morning the general condition was better, but there was intense pain in the limb and oedema up to the knee. This was treated with warm baths. Next day the leg was enormous, but in spite of bouts of vomiting the general condition improved after an injection of 20 cc. of antiserum. The subcutaneous injection of a solution of potassium permanganate at the periphery of the wound led to a notable improvement. After this the patient rapidly recovered.

ii. Commenting on the frequency of rapidly fatal effects of the bite of Dendraspis, Mme. Phisalix asks if the venom is more diffusible than that of other Proteroglypha or if more efficient injection is the cause. She shows that the poison fangs are very fine, long and canalized and that they are rotated far forwards so that the act of biting is like a dagger stroke (*coup de poignard*). At the same moment the venom is injected under pressure deep into the tissues, from which it does not escape along the fine tracks left by the fangs. Dendraspis, therefore, injects the venom of the Colubridae by means of the efficient apparatus of the Viperidae. With regard to the properties of the venom itself, there is as yet not enough information on which to form definite opinions. *C. W.*

KELLAWAY (C. H.) & TRETHEWIE (E. R.). **The Liberation of Adenyl Compounds from Perfused Organs by Cobra Venom.**—*Australian Jl. Experim. Biol. & Med. Sci.* 1940. Mar. Vol. 18. Pt. 1. pp. 63–88. With 10 figs. [13 refs.]

The following are the authors' conclusions :—

" The electrocardiographic changes observed in the rabbit after the intravenous injection of cobra venom were bradycardia, increase in the P-R interval, R.S.T. deviation and terminal heart block, and in the cat

increase in rate, inversion of the T wave, extrasystoles, increased P-R interval (irregularly), appearances resembling branch bundle block and, finally, ventricular fibrillation.

" The injection of cobra venom causes the appearance of adenyl compounds in the outflowing perfusate from the perfused liver of the rabbit ; this outflow represents only a proportion of the total loss of adenyl compounds from the organ owing to inactivation in the organ itself and in the perfusate by enzymes which are also set free by the venom. The proportion estimated in the perfusate increases when this is collected at 95°C. or when Tyrode containing M/40 NaCN is used as the perfusion fluid. Normal liver perfusate contains neither adenyl compounds in estimable amounts nor the inactivating enzymes. Lacarnol (Bayer) when perfused through the normal liver or when mixed with perfusate from the envenomed organ is inactivated. There is no inactivation when it is mixed with perfusate from a normal organ.

" Adenyl compounds and inactivating enzymes are liberated from the perfused envenomed kidney of the rabbit, but NaCN M/40 is not very effective in preventing the action of the enzymes.

" Adenyl compounds are set free from the perfused heart of the rabbit and of the cat by the injection of cobra venom.

" Lysocithin also causes the liberation of adenyl compounds from the perfused liver of the rabbit and the perfused heart of the cat. The outflow reaches a maximum at once whereas that after cobra venom is somewhat delayed. This substance is probably partly responsible for the liberation of adenyl compounds by venom.

" The part played by the local liberation of adenyl compounds in producing the cardiac effects of cobra venom is discussed."

NAKAMURA (Tutomu). Ueber die Wirkung des Gifts von *Naja naja atra* auf das Froschherz. [**The Action of the Venom of** *N. naja atra* **on the Heart of the Frog.**]—*Acta Japonica Med. Trop.* Formosa. 1940. Mar. Vol. 2. No. 1. pp. 167–190. With 8 figs. [39 refs.]

TABORDA (Armando). Contribuição ao estudo da coagulação do sangue. I. Falhas nos metodos de coagulação do sangue pelos venenos de cobra. [**Blood Coagulation. I. Pitfalls in Coagulation of Blood by Snake Venom.**]—*Mem. Inst. Butantan.* 1939. Vol. 13. pp. 431–445. With 2 graphs. English summary.

" The influencing factors of horse blood coagulation by snake venoms (*Bothrops*) have been studied, with control and investigation scope, as follows :

" a. Variability of clotting-time from horse to horse, with a constant venom amount (standard venom) compared with changing amounts of venom in a pre-fixed clotting time ;

" b. Concentration influence of the same or different anticoagulants ;

" c. Temperature influence on the test and non-influence of time changes on the animal. Constant temperature testing necessity (20°C.) and inconveniences of high temperatures, exercising a denaturating action on the coagulating principle ;

" d. Necessity of the use of a standard venom (fresh venom high vacuum dried), which is able to furnish stable solutions and reportable data.

" According to our experiences, the coagulant unity (U.C.) has been fixed as : the amount of venom required, in gammas, to clot in exactly 10 minutes at 20°C., 1 cc. of a mixture of 2·5 cc. oxalated horse-blood (determined oxalate concentration) and 0·5 cc. of physiological brine solution, considering the blood coagulated at the first clot appearance."

TAYLOR (J.). **Observations Relative to the Standardization of Cobra Antivenene.** *Indian Jl. Med. Res.* 1940. July. Vol. 28. No. 1. pp. 279–290.

The author summarizes his views as follows :—

" 1. On account of differences found in the toxicity of different samples of cobra venom which may be available for testing the potency of antivenene it is suggested that assay should be carried out on the basis of the number of ' certain lethal doses ' neutralized by a given quantity of serum.

" 2. If a figure of *d.c.l.* is established for the selected test animal of given weight by the chosen route which is taken as the ' standard toxicity ' of the venom of the species the results could be expressed in terms of weight of standard toxin neutralized.

" 3. The observations made on the neutralization of 1 *d.c.l.* and its multiples show the necessity of eliminating the effect of natural resistance of the test animal's organism in calculating the potency of a serum. The formula applied by Ipsen to Banic and Ljubetic's findings appears to be a suitable basis of calculation. A simpler method of calculation is given on the basis of proportion found to exist between the amount of antivenene required to neutralize 1 *d.c.l.* and its multiples.

" 4. The opinion is expressed that the direct estimation of the potency of cobra anti venom serum in terms of the weight of dried venom neutralized per cubic centimetre is more suitable than assay in terms of a ' standard serum ' with arbitrary unitage."

[See also IPSEN, this *Bulletin*, 1939, Vol. 36, p. 861.]

GHOSH (B. N.) & KUNDU (N. L.). **The Reaction between *Vipera russellii* Venom and its Antivenene.**—*Indian Jl. Med. Res.* 1940. Apr. Vol. 27. No. 4. pp. 1121–1127.

CHOWHAN (J. S.). **Routine Treatment of Epilepsy, with Snake Venom.** [Correspondence.]—*Indian Med. Gaz.* 1940. June. Vol. 75. No. 6. p. 382.

Cobra venom acts as an anticonvulsant, and probably reduces the sensitivity of the higher centres to extraordinary incoming impulses. Russell viper venom appears to alter the mineral and water metabolism and thus influences the epileptic convulsions. Extract of *Rauwolfia serpentina* is given by the mouth as a sedative and is used along with the injections of the venoms. Details of dosage are given, but the author does not, in this letter, give figures of the cases treated.

C. W.

FOSSEN (A.). Vergiftiging door den beet van zeeslangen. [**Poisoning by the Bite of a Sea Snake.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1940. Apr. 30. Vol. 80. No. 18. pp. 1164–1166. English summary (8 lines).

" The author describes two cases of the bite of a sea snake. The first patient suffered from haemoglobinuria, marked swelling of the glandulae parotis [*sic*] and paresis of the muscles of head and extremities. He died six days after the bite.

" The second patient, who died 12 hours after the bite, suffered also from haemoglobinuria and swelling of the parotis glands.

" In both cases the snake has not been captured, so that the identity remains unknown."

Barros (Evandro F.). Aspectos clinicos da intoxicação escorpiônica. [**Clinical Aspects of Scorpion Poisoning.**]—*Mem. Inst. Biol. Ezequiel Dias.* 1938. Vol. 2. pp. 101–287. [28 refs.] English summary.

The author gives details of each of 629 cases of scorpion sting treated in Belo Horizonte from 1919 to 1936; all were due to *Tityus serrulatus*. The cases are classed as benign or severe, the latter including those in which respiratory or cardiac disorders, nausea or vomiting, occurred within two hours of the sting. When these symptoms occurred, they always commenced within one hour of the sting, so that the two-hour period is actually more than enough for distinction. The symptoms are described as follows:—

a.—Benign Cases.

"*Local symptoms*—as follows: pain, numbness; hyperemia, oedema; fibrillary muscular contractions.

General symptoms—as follows: sweating and disorders of temperature regulation; pilomotor reflex; sense of ill-being; adynamia and drowsiness; agitation; headache; dizziness.

Disorders of the respiratory system—Increased secretion of the glands of the nasal mucosa is observed.

Disorders of the circulatory system—as follows: acceleration of the heart rate; peripheral vasoconstriction.

Disorders of the digestive system—as follows: increased salivary secretion; defecation (voluntary or involuntary).

Disorders of the urinary system—as follows: micturition (voluntary or involuntary).

Disorders of sensory organs and related glands—lacrimation; disorders of sight."

b.—Severe Cases.

"All symptoms described in the benign case can obviously be observed in the severe one in which they appear generally in their greatest intensity.

Local and general symptoms—are the same we have just described, but they are here generally more frequent and of a much more severe character.

Disorders of the respiratory system—as follows: increased secretory activity of the nasal mucous glands; coughing, sneezing; changes in the respiratory rate (increased or retarded).

Disorders of the circulatory system—namely: changes of the heart beat (tachycardia or bradycardia, extrasystoles); peripheral vasoconstriction.

Disorders of the digestive system—namely: increased salivary secretion; gastro-intestinal disorders (thirst; nausea, vomiting, intestinal pains, defecation, diarrhea).

Disorders of the urinary system—namely: micturition (polyuria, oliguria, glycosuria).

Disorders of sensory organs and related glands—namely: lacrimation; visual disorders; disorders of taste."

The local symptoms are not regarded as essential to the scorpion poisoning syndrome, which is regarded as indicating damage to the vegetative nuclei of the hypothalamus and to the vasomotor centres. The disorders of the heart and respiratory rate are due to the effect of the poison on the vagal centres, and this probably also is true of the gastro-intestinal disorders. Reference is made to the work of de Magalhães in this connexion [see this *Bulletin*, 1939, Vol. 36, pp. 865, 866]. The sole effective treatment in severe cases is the

intramuscular or intravenous injection of 20 to 40 cc. of anti-scorpion serum, repeated hourly until the symptoms abate. In children 80 cc. should be given at the first injection, and especially vigorous treatment is necessary if more than two hours have elapsed since the sting. In benign cases serum is only necessary if pain and adynamia are intense. *C. W.*

SERGENT (Etienne). Sur quelques idées erronées concernant les scorpions de l'Algérie. [**False Ideas concerning Algerian Scorpions.**]—*Arch. Inst. Pasteur d'Algérie.* 1940. Mar. Vol. 18. No. 1. pp. 38–42.

There are certain widely held misconceptions about scorpions in Algeria. The first is that their venom is more potent in summer than in winter, but in careful tests the author has been unable to detect any difference ; the scorpions themselves are, however, more active in summer than in winter. The second is that black scorpions are the most dangerous. *Prionurus liouvillei* is black and is rare in Algeria, but its venom has been shown to be less toxic than that of the lighter *P. australis* and, furthermore, the amount of venom in the telson of *P. liouvillei* is less than that in *P. australis*. The third is that if a scorpion is surrounded by a ring of fire it stings itself to death. This is not true, the scorpion strikes its sting against the cephalothorax, but the sting does not penetrate. It is killed in attempting to pass through the flames. The fourth is that scorpions are carried by the wind, in stormy weather, to the upper floors of buildings. This again is untrue, the scorpions are more active in the windy season and are found high up in buildings because they have climbed the walls.

C. W.

MALARIA.

Précis of Abstracts in this Section.

FAUST and PARKER (p. 173) discuss malaria mortality in the southern United States, which in 1938 was the lowest on record. An early rise in the rate is expected in accordance with previous cycles, unless there is effective control.

BAISAS (p. 174) reports that the importation of labour into Lahuy Island, which was reputed to be free from malaria, was followed by an outbreak in which adults suffered more than children. *A. flavirostris* and *A. maculatus* breed in the island.

MOST (p. 174) reviews the subject of malaria in drug addicts in New York. The majority of the infections are due to *P. falciparum*, and cerebral symptoms are common. Gastro-intestinal symptoms and blackwater fever have also been observed. Infection is acquired from the use of hypodermic syringes, which are not sterilized, for the intravenous injection of the drugs. MOST and JOLLIFFE (p. 175) give in detail the treatment they employ in these cases.

SHUTE (p. 176) found that *A. maculipennis* var. *atroparvus* from English sources could not be infected with Indian or African strains of *P. falciparum*, though infection with *P. vivax* and *P. ovale* is easily

accomplished. GARNHAM (p. 176) states that in Kisumu *A. funestus* shows greater predilection for human habitations, as compared with cattle sheds, than does *A. gambiae*. He discusses the habits of *A. funestus* in relation to malaria, and distinguishes three varieties of the type form according to the amount of pigment found on the tergal plates of the 5th abdominal segments of the larvae. Since most *A. hyrcanus* var. *sinensis* caught in a house in Shanghai over a long period were found in bedrooms, HU (p. 176) suggests that screening of the windows of the bedrooms would be a cheap and effective antimalaria measure.

DANIEL (p. 177) records a number of cases in which malaria simulated acute abdominal conditions, and points out that leucopenia is a suggestive point in diagnosis.

FORBES (p. 177) discusses the action of quinine in causing nerve deafness and points out that quinine given to a woman during pregnancy may cause deafness and amblyopia in the child. Quinine has a predilection for the auditory nerve. COLE *et al.* (p. 178) point out that alarming symptoms may be met in the course of therapeutic malaria and may necessitate the termination of this form of treatment. They have therefore attempted to find a drug which will control these symptoms without eliminating the malaria, and report that sodium bismuth thioglycollate (thio-bismol) fulfills these conditions. In *P. vivax* infections one intramuscular injection of 0·2 gm. gives a 48-hour respite from fever, or will transform a quotidian to a tertian fever. Repeated injections can arrest clinical malaria for long periods. The drug is not a substitute for quinine.

WATSON (p. 178) refers to the great progress which has been made in malaria control in India. VEYRE (p. 179) considers that neglect of control measures has led to increase in malaria in part of Tonking.

LAMPRELL (p. 179) shows that on a tea estate in Assam the administration of quinine or atebrin, in the absence of larval control, produced results in the prevention of malaria which were better than might have been expected. After the cessation of administration, however, the incidence of malaria in the treated persons was much higher than in controls.

DZHANGIROV (p. 179) reports that an infusion of tobacco dust in water is a most effective spray against adult mosquitoes, especially if 0·5 per cent. soft soap is added. The mixture remains in good condition for only 10 hours.

MORGAN (p. 180) states that paddocks planted with the grass *Melinis minutiflora* will not harbour mosquitoes, but unfortunately this grass will not grow on swampy ground. *C. W.*

FAUST (Ernest Carroll) & PARKER (Virginia). **Malaria Mortality in the Southern United States for the Year 1938.**—*Southern Med. Jl.* 1940. Aug. Vol. 33. No. 8. pp. 897–900. With 2 figs.

Malaria mortality for 1938 in the Southern United States as a whole was the lowest on record. The average rate per 100,000 was 5·8 as compared with 6·9 for 1937, 6·6 for 1931, the lowest annual rate of the previous cycle, 11·9 for 1929, and 11·4 for 1933, the highest annual rates. The most marked decline was in Georgia, from 7·6 in 1937 to 4·6. It would appear that the low point in the five-to-seven year cycle was reached in 1938, and that, barring effective control, an early rise in the mortality curve may be anticipated. An interesting

graph illustrates the cyclical nature of the malaria mortality curves for 14 States. A map illustrating malaria mortality by counties enables the reader to visualize the general distribution of infection. The highly malarious territory is concentrated in a south-eastern wedge of counties and in the Cairo-Natchez portion of the Mississippi Valley. Malaria endemicity is also moderately high in the Red River Valley and in the lower Rio Grande. *Norman White.*

BAISAS (Francisco E.). **Malaria and Mosquitoes in Lahuy Islands, Camarines Sur.**—*Monthly Bull. Bureau of Health.* Manila. 1939. Nov. Vol. 19. No. 11. pp. 425–435. With 7 figs.

Lahuy Island was reputed to be free from malaria ; the importation of labour for the mines of the Pan-Philippines Corporation was followed by an outbreak of malaria, in which adults suffered more than children. This report gives the results of a short inquiry into malaria conditions and recommendations concerning the control of the disease. *A. flavirostris* and *A. maculatus* were found breeding in the Island.

N. W.

MOST (Harry). **Malignant Malaria among Drug Addicts. Epidemiological, Clinical and Laboratory Studies.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1940. Aug. 16. Vol. 34. No. 2. pp. 139–172. With 7 figs. (5 on 4 plates). [26 refs.] Also in *Amer. Jl. Public Health.* 1940. Apr. Vol. 30. No. 4. pp. 403–410. With 3 figs. (Epidemiologic Studies.) ; & *Amer. Jl. Trop. Med.* 1940. July. Vol. 20. No. 4. pp. 551–567. With 3 figs. (Clinical Aspects.)

This is a study of malignant malaria, predominantly of the cerebral type, occurring among drug addicts in New York City. Infection is acquired by the common use of hypodermic syringes for the intravenous injection of the drug, notably heroin. Naturally acquired malaria is an uncommon disease in New York City. Since 1933 there has been a continued stream of admissions to the Bellevue Hospital of drug addicts suffering from malignant malaria. More than 100 of them have died of malaria in New York City since 1934. During the five years 1928–33 there were but 70 cases of malaria in the Bellevue Hospital among some 59,000 total admissions, and these cases were mainly *P. vivax* infections. During the succeeding quinquennium there were 180 cases among a comparable number of admissions ; the increase was due to *P. falciparum* malaria among drug addicts. In 1938, of the 54 malaria cases in the entire hospital 45 were in *P. falciparum* infected drug addicts, and nine proved fatal. The series of cases studied by the author exceeded 200 : with the exception of one *P. vivax* and one *P. malariae* all were *P. falciparum* infections. Nothing is known as to the origin of the infecting strains but it is significant that many of the original cases of this type reported in the United States occurred in seaports or coastal cities and among sailors.

A batch of *A. quadrimaculatus* was fed on one gametocyte carrier of the series ; development of the parasite to the oöcyst stage was noted.

Though cases of the cerebral type were predominant, cases with gastro-intestinal syndromes occurred and there were two cases of blackwater fever. The cerebral symptoms observed were stupor,

coma, occasional convulsions, and neurological signs suggestive of an acute diffuse meningitic or encephalitic process. Death in the majority of fatal cases was due to an overwhelming infection, with diffuse cerebral involvement.

Before the disease was well known, diagnosis was difficult. The author considers that any acute illness or unexplained clinical syndrome in an individual showing evidence of drug addiction warrants a provisional diagnosis of malignant malaria. In the later months of 1933, when the epidemic was recognized in New York, most patients died. In later years earlier recognition and more intensive treatment have much lowered the mortality rate. In the Psychiatric Division of the Hospital, however, many patients are still admitted with an advanced cerebral form of the disease.

The paper describes the treatment adopted. This subject is dealt with in a further contribution to the literature [see MOST & JOLLIFFE below]. *N. W.*

MOST (Harry) & JOLLIFFE (Norman). **Treatment of the Falciparum Malaria of Drug Addicts.**—*Amer. Jl. Med. Sci.* 1940. Sept. Vol. 200. No. 3. pp. 367–372.

The authors' treatment of *P. falciparum* malaria of drug addicts is a combination of specific chemotherapy and supportive measures. If there be involvement of the nervous system, or diarrhoea and vomiting, quinine is given intravenously—0·6 gm. in 10 cc. physiological saline every 3 to 4 hours for 24 hours. No food is given. From 2,000 to 5,000 cc. of fluid is given parenterally each day in the form of a 5 per cent. solution of glucose in physiological saline to which is added 10 mgm. of thiamin chloride. This is continued till catheter specimens of urine are free from acetone and have a specific gravity of less than 1,015. If there be severe anaemia or jaundice, or if the urine be bright red or brown, containing oxyhaemoglobin or methaemoglobin, or if shock be present, or if the plasma proteins be low, 500 cc. of whole citrated blood is given as a transfusion : this is repeated 12 to 24 hours later if there be still evidence of marked haemolysis. If there be marked cyanosis oxygen is administered. If there be no remission in the depth of the coma within 8 hours 50 cc. of spinal fluid are withdrawn and 50 cc. of a 50 per cent. glucose solution and 1 cc. of a 1 in 10,000 adrenalin solution are given intravenously. This procedure may be repeated in 6 hours. [The strength of the glucose solution is given as 50 per cent. This may be a misprint for 5 per cent.]

When clinical improvement is noted, usually on the second day, the interval between quinine injections is lengthened to six hours ; then to 8 hours on the 3rd day, and to 12 hours on the fourth day. No attempt is made to withhold heroin or morphine until the patient is convalescing from malaria.

The next phase of treatment is the administration of atebrin by mouth, 0·1 gm. three times daily for 7 days. If at the end of this time gametocytes are found, plasmoquine is given for four days, 0·02 gm. three times a day.

In less severe cases less vigorous treatment is adopted. In simple malaria, latent cases and gametocyte carriers, atebrin and plasmoquine are used in doses mentioned above.

In 1939 there were only 2 deaths in 50 acute cases, as compared with a 50 to 75 per cent. case mortality rate when the cerebral form of the disease was recognized. *N. W.*

SHUTE (P. G.). **Failure to infect English Specimens of** *Anopheles maculipennis* **var.** *atroparvus* **with Certain Strains of** *Plasmodium falciparum* **of Tropical Origin.**—*Jl. Trop. Med. & Hyg.* 1940. July 1. Vol. 43. No. 13. pp. 175–178. [10 refs.]

A. maculipennis var. *atroparvus* from English sources can be readily infected with *P. vivax* and with *P. ovale*. It has also been used for the successful transmission of Italian and Rumanian strains of *P. falciparum*. The author describes his attempts at infecting this English anopheline with one Indian and three tropical African strains of *P. falciparum*, without success. The failure cannot be ascribed to insufficiency or immaturity of gametocytes, nor yet to temperature. The conclusion is justified that persons carrying gametocytes of *P. falciparum* of tropical origin would be very unlikely to transmit infection in this country through the agency of English *A. maculipennis*. [See also this *Bulletin*, 1919, Vol. 14, p. 86; 1920, Vol. 15, pp. 108, 399; Vol. 16, p. 308.] *N. W.*

GARNHAM (P. C. C.). **Epidemiology of** *Anopheles funestus* **Malaria with Special Reference to Tergal Plate Varieties and Maxillary Indices.**—Reprinted from *Conventus Tertius de Tropicis Atque Malariae Morbis II, Amsterdam 1938.* pp. 161–177. With 9 figs.

A. funestus is second only to *A. gambiae* in importance as a vector of malaria in tropical Africa. In Kisumu, Kenya, there are anomalies in the transmission of the disease by this species to which the author calls attention. The density of *A. funestus* rises to a maximum at a time when malaria incidence is declining. The type form of *A. funestus* in Kisumu has a seasonal prevalence much less connected with rainfall than has *A. gambiae*; the maximum prevalence occurs some three months after the season of maximum rainfall and there is a fair production of the species throughout the year. The type form has a much greater predilection for human habitations as compared with cattle sheds, than has *A. gambiae*. The sporozoite infection rate is higher in the dry season than during the rains; in the dry season malaria is on the wane. In Kisumu there is a large amount of quartan malaria, particularly in young children; it is mild and the patients rarely come for treatment. Malaria cases treated are almost all subtertian. *A. funestus* is a very efficient transmitter of *P. malariae*.

Three varieties of the type form of *A. funestus* have been distinguished, according to the amount of pigment in the tergal plate, 5th abdominal segment, of the larva: light, intermediate and dark plate varieties occur. The first variety is the commonest: the other two are found during the rains. All three carry malaria. The maxillary index was constant, round about 11. There was no significant difference between the maxillary indices of wild infected and uninfected mosquitoes. *N. W.*

HU (Stephen M. K.). **The House-frequenting Behavior of** *Anopheles hyrcanus* **var.** *sinensis* **Wiedemann in the Shanghai Area, Part 3. Indoor Resting Places.**—*Lingnan Sci. Jl.* 1940. Vol. 19. No. 3. pp. 403–410. With 1 text fig. & 3 figs. on 2 plates.

In a farmhouse near Shanghai, consisting of store room, living room, kitchen and bedroom, search was made for anophelines once a fortnight

from April to November. The collections were made in the mornings. Of the total number of 262 *A. hyrcanus* var. *sinensis* taken, 81·2 per cent. were found in the bedroom. Bedrooms in such farmhouses usually contain but one small window each : screening these windows would be a cheap and probably effective antimalaria measure.

N. W.

DANIEL (Rollin A.). **Malaria simulating Acute Surgical Diseases of the Abdomen.**—*Ann. Surgery.* 1940. Mar. Vol. 111. No. 3. pp. 436–445.

The author describes nine cases of malaria which on admission to hospital displayed symptoms strongly suggestive of acute abdominal disease calling for surgical intervention. Eight of these cases occurred among a total of 266 patients, admitted during 13 years to the Vanderbilt University Hospital, in whom a diagnosis of malaria was made, regardless of the conditions for which the patients were admitted to hospital. One patient was a child of 15 ; eight were adults. Seven had *P. vivax* infections, an unusually high proportion in cases of this kind. The other two patients were infected with *P. falciparum.* Six patients were admitted as emergencies to the surgical service. In six patients there was a sudden onset of severe abdominal pain ; in the other three the pain was mild at first, but gradually increased in severity. In most of the cases high fever was not a prominent symptom. The spleen was enlarged in only one patient and in this case marked abdominal tenderness and muscle spasm rendered the spleen non-palpable. In three there was definite involuntary rigidity of the abdominal wall. In establishing a diagnosis the existence of leucopenia was suggestive in eight cases. The finding of malaria parasites in the blood does not of course preclude the possibility of the co-existence of intraperitoneal disease : in illustration of this the author cites another case in which tertian malaria complicated a localized peritonitis arising from a perforated duodenal ulcer. All the nine patients of the series recovered in response to malaria therapy.

N. W.

FORBES (S. B.). **The Etiology of Nerve Deafness with Particular Reference to Quinine.**—*Southern Med. Jl.* 1940. June. Vol. 33. No. 6. pp. 613–620. With 13 figs. [16 refs.]

The author passes in review published work regarding the action of quinine in causing deafness. He describes four cases of so-called congenital deafness. In all of these cases the mother had taken considerable quantities of quinine during pregnancy. A large number of cases of all types of deafness from the author's records are reviewed. In 92 of 234 cases of nerve deafness there was a definite history of the ingestion of quinine over a considerable period of time : eighteen of these patients thought that quinine had caused their deafness. Of 832 cases of deafness other than nerve deafness only 82 had taken quinine and none of them associated the taking of quinine with their deafness. It is well established that quinine has a predilection for the auditory nerve. There is experimental and clinical evidence that quinine administered to the mother during pregnancy may cause

deafness, and amblyopia, in the child. A number of audiograms are shown, illustrating the suggestive rôle of quinine in the causation of nerve deafness. *N. W.*

COLE (Harold N.), DEOREO (Gerard A.), DRIVER (James R.), JOHNSON (Herbert H.) & SCHWARTZ (Walter F.). **Use of Bismuth Injections to manage Course of Therapeutic Malaria.**—*Jl. Amer. Med. Assoc.* 1940. Aug. 10. Vol. 115. No. 6. pp. 422–426. With 3 charts. [20 refs.]

Therapeutic malaria in the treatment of syphilis of the central nervous system may produce alarming symptoms such as prolonged remittent fever, physical exhaustion, vascular collapse [presumably syncope], persistent vomiting, increasing anaemia, rapidly rising icteric index, or rapidly rising blood urea nitrogen. If some agent could be found which would cause a temporary interruption of the fever, sufficient to permit of recovery from such symptoms, the course of malaria therapy might be completed, when otherwise it might have to be abandoned. To this end the authors have experimented with preparations of various heavy metals. They find that thio-bismol answers the requirements. Thio-bismol is sodium bismuth thioglycollate, $Bi(SCH_2CO_2Na)_3$, and contains 38 per cent. of bismuth. The average 0·20 gm. intramuscular dose contains 75 mgm. of metallic bismuth. The bismuth content of the blood reaches a very high level within a few hours of the injection and then as rapidly drops. The action of the drug appears to be a bismuth effect on the malaria parasite: sodium thioglycollate alone has no effect on the malaria. The results of the use of thio-bismol in the treatment of 103 patients undergoing malaria therapy are recorded. *P. vivax* is the species used for malaria therapy and infection is procured by blood inoculation. In prolonged remittent fever a single injection of thio-bismol generally procures a forty-eight hour respite from fever, after which paroxysms return on alternate days. A single injection will transform a quotidian (double tertian) into a tertian fever. Repeated injections can arrest clinical therapeutic malaria for long periods. In 92 cases there were but four in which a single injection of the drug produced no effect on the malaria. Thio-bismol is not a substitute for quinine in terminating malaria, but by its use many untoward therapeutic malaria results may be avoided. *N. W.*

WATSON (Malcolm). **Prevention of Malaria in India. Recent Advances.**—*Nature.* 1940. June 8. Vol. 145. No. 3684. pp. 878–881. With 1 fig.

The author has recently made a tour in India, visiting Delhi and Hyderabad, and estates in Southern India, Assam and Bengal. He contrasts the work now being done in the control of malaria with the state of affairs eleven years ago when he made a similar tour in India. He reports astonishing progress. He expresses the opinion " that the work in India is the greatest achievement in the control of malaria in the past decade; that the best of it, and there is much ' best,' is worthy of comparison with the best work done at Panama or with Mussolini's great achievement in the Pontine Marshes; and in area it is vastly greater than either." *N. W.*

Veyre. Recherches sur le paludisme à Cao-Bang et sur l'évolution de l'endémie pendant la dernière décade. [**Malaria in Cao-Bang and the Evolution of Endemic Malaria there during the Last Decade.**]—*Rev. Méd. Française d'Extrême-Orient.* 1940. Jan. No. 1. pp. 8–22. With 4 charts & 2 maps.

Cao-Bang is on a peninsula formed by the confluence of the Sông-Hiem with the Sông-Bang-Giang, in the north of Tonking. It has a reputation of being a healthy station, but the author shows that there is a considerable amount of endemic malaria which has recently shown a tendency to increase. The increased prevalence is attributed to recent neglect of measures of control which gave good results in 1933–1935. The observations recorded are of local interest.

N. W.

Lamprell (B. A.). **Quinine and Atebrin in the Control of Malaria ; with Special Emphasis on the Practical and Economic Viewpoints.** —*Indian Med. Gaz.* 1940. May. Vol. 75. No. 5. pp. 266–274. With 7 figs.

On a tea estate in the Sibsagar District of Assam malaria is hyperendemic. *A. minimus* is the principal vector. Within the half-mile radius of the main lines, in which there is a population of 2,173 persons, there are ten miles of water-courses in which the vector breeds. An annual expenditure of Rs. 1,400 on larvicides and sprayers did not effect much improvement. In 1938 antilarval measures were suspended and an experiment was made to control the incidence of malaria by the issue of prophylactic drugs, limiting the expenditure to the sum of Rs. 1,400 previously spent on destroying larvae. Considering the inadequacy of the expenditure the results appear to have been better than might have been expected. One group received a five-day course of atebrin and thereafter each adult was given 0·2 gm. of atebrin one day a week from the end of May till mid-September. Members of a second group received quinine on five consecutive days every third week. A third group acted as a control. There was a diminished prevalence of the disease in both atebrin and quinine groups during the period of drug administration, but the incidence of malaria in the weeks following the cessation of drug administration was much higher than in the control group, more especially in the group that had received atebrin. The diagnoses were clinical ; no blood examinations were made. *N. W.*

Dzhangirov (K. G.). Utilisation de l'infusion du tabac dans la lutte contre le moustique. [**Tobacco Infusion as a Spray against Mosquitoes.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1939. Vol. 8. No. 5. pp. 93–94. [In Russian.] [Summarized in *Rev. Applied Entom.* Ser. B. 1940. Oct. Vol. 28. Pt. 10. p. 186.]

" Tobacco dust is often used for fumigating against adult mosquitos in day-time shelters and hibernation quarters in the tobacco-growing district of Slavyansk in northern Caucasus, but the fumigation is unsatisfactory in many of the buildings owing to cracks in walls and other defects. Experiments on the possibility of using the tobacco as a spray against mosquitos in cellars were therefore carried out in

December 1938. The spray was prepared by allowing 5 lb. tobacco dust to steep in 1 gal. cold water for 1–2 days and then straining the infusion, which contained about 0·1 per cent. nicotine. Examination of the cellars 24 hours after spraying showed that 88·7–97 per cent. of the mosquitos were killed when the infusion was used alone, and 100 per cent. when 0·5 per cent. soft soap was added to it just before it was applied. The mixture did not remain in good condition for more than ten hours."

MORGAN (Edward). **The Tropical Grass "Melinis Minutiflora" as a Preventative against Malaria and Other Tropical Diseases.**—*Jl. Trop. Med. & Hyg.* 1940. July 1. Vol. 43. No. 13. p. 179.

Melinis minutiflora, also known as Gordura or Capim Melado, is a coarse grass that has done much in Venezuela to control pests. If paddocks be planted with this grass, mosquitoes, snakes, etc., become almost non-existent when the grass is green. To quote the author :—

"... cattle covered with ticks when entering such planted areas would, after a few weeks' stay, be free of these parasites (provided they were kept entirely on this grass in its green stage). Apart from its anti-tick effects, it is a grass rich in protein and is thus extensively planted both in Venezuela and Colombia for fattening animals .... It has a peculiar penetrating and pleasant odour .... When walking through the damp pasture one's boots appear as having been greased, due to the kind of oily substance it contains. This probably is the principle secret of its anti-verminous effects."

Unfortunately the grass will not grow on swampy ground. *N. W.*

MISCELLANEOUS.

CULWICK (A. T.) & CULWICK (G. M.). **A Study of Population in Ulanga, Tanganyika Territory.**—Reprinted from *Sociological Rev.* 1938. Oct. Vol. 30. No. 4 and 1939. Jan. Vol. 31. No. 1. 34 pp. With 2 figs.

After showing the inadequacy of available vital statistics in the Ulanga district the authors explain their method of random sampling, by which information was obtained from over 2,300 women of all ages. It is pointed out that the authors, having lived and worked in the district for 4 years, were well known to the natives and that they consider the information collected to be reliable enough to allow conclusions to be drawn. Cross-enquiries were made from time to time, with satisfactory results. By questioning the women, information was obtained as to marriage, number of children born and number of children dead. Rough estimations of age in the latter category were made, and the ages of the women themselves at the time of questioning were also estimated in broad age groups.

In 6 areas it was observed that the fertility rates could be divided into two groups which differed significantly from each other not only in total fertility but also in age distribution ; that is, not only was the one group less fertile, but the fertility of the older women in that group was less than that of the younger in that the older women

showed an unduly high proportion of sterility after the birth of the first child. This dates back in many instances to the great Maji-Maji Rebellion of 1905–6 and the famine which followed it, and the areas thus affected in fertility were those involved in the rising and which suffered destruction of their crops and confiscation by the Germans of their food reserves. The areas of higher fertility were those which remained loyal to the Germans. The famine not only caused extremely high casualties, but appears to have reduced the average fertility of the surviving women by over 25 per cent., but there has been a considerable increase in fertility during the last 15 years.

The influence of polygamy was next considered, and the authors point out that polygamy is not and cannot be common, concluding from their enquiries that the polygamy which exists has no effect upon the birth rate.

Infant mortality in the accepted sense was impossible to assess, but the authors' work leads them to the conclusion that roughly 25 per cent. of the children born are lost during the first 6 months of life and about 13 per cent. more die between 6 months and the age of weaning, bringing the total wastage of child life before weaning to 38 per cent. In comparing this rate in the different age-grades of the mothers it appears that there is no sign of improvement in the position during the 30-year period covered by the investigation, for " the young mothers of 20–30 show a rate of 376 per 1,000 live births as against 384 and 370 for their elders." It is pointed out that the rate in first children is 423, in subsequent children 354. There is, however, some evidence to suggest a decline in infant mortality in very recent years. It is further shown that 53 per cent. of children died in the years between birth and puberty, and since by tribal custom the ceremonies associated with the attainment of puberty are distinctive, and since mothers have shown no hesitation in recalling whether or not the dead child had passed this important point, the authors regard this figure as the most reliable of all.

In discussing the distribution of surviving children the authors show that the ratio of children to adults is only 40 per cent. The distribution in the different age grades of childhood is such that it is concluded that there has been a sudden drop in fertility in very recent times. This may be due to the campaign, started in 1935, to persuade mothers not to feed infants on solid food. The campaign has had considerable success and has probably led to a diminution in mortality and therefore to a prolongation of the suckling period during which the taboos of native custom prevent conception.

With regard to the balance of births and deaths it is shown that the net reproduction rate is only 0·73 in the old women and that on this basis the population may be expected to decrease at the alarming rate of 27 per cent. for each generation, unless conditions change. Similar figures are found in considering somewhat younger women, but in those aged 20–30 the decline appears to be less, and it is thought that at last fertility is increasing. The causes of infant mortality need urgent investigation and there are indications that syphilis may be an important feature.

[This valuable paper and its implications deserve close study. It is evident that the work could not have been carried out without great care and thought, and without gaining the confidence of the natives.] *C. W.*

NAPIER (L. Everard) & DAS GUPTA (C. R.). **Haematological Studies in Indians. Part XII. Haemoglobin Standards in Children and Adolescents.**—*Indian Jl. Med. Res.* 1940. July. Vol. 28. No. 1. pp. 207–224. With 9 figs.

Three series of Indian boys and girls in Calcutta, aged from 4 to 20 years, were investigated. The haemoglobin was estimated by the Hellige method, and the heights and weights of the children taken. The first series comprised 208 Indian Christian and Bengali Hindoo girls from middle class families. In the second series were 553 Hindoo boys of middle class and in the third series were boys of the Punjabi Sikh artisan class. The data are set out graphically and in tables, and in the latter correlations between Hb. and height and weight are given as plus or minus [no degree of correlation is calculated]. The authors say that on the grounds of being above or below the average weight for their age it is possible to divide Bengali boys into two groups in which the Hb. curves are significantly different from one another, the better nourished boys having distinctly higher haemoglobin [statistics are not given]. The curve rises from 11·5 gm. Hb. per 100 cc. blood at 5 years to about 13·5 at 16 years. They conclude that the Hb. level of the adult, about 15 gm., is not reached until about the 25th year. The female curve departs from the male curve about the 11th year and subsequently rises more slowly to the adult level of 12·5 gm. There seemed to be little difference between the Hb. curves of the two groups of boys investigated. The weight curves run parallel up to the 14th year, after which Sikh boys are heavier. The Bengali boys are slightly taller up to 14 years, after which the height curves cross [the statistics of significance are again not given and as the groups are of different sizes visual inspection of the curves may be, to some extent, misleading]. *W. P. Kennedy.*

HARE (K. P.). **Clinical Investigations into Anaemia in Assam. Parts I–VII.**—*Indian Jl. Med. Res.* 1940. Apr. Vol. 27. No. 4. pp. 1041–1099. With 1 map. [19 refs.]

Severe anaemia is common among tea estate coolies in Assam, though European residents have normal blood pictures. The haemoglobin level in the coolies is low compared with that of city dwelling Indians, and the severe microcytic hypochromic anaemia seems to be an exacerbation of this partial anaemia. The only constant correlation found was that between low Hb. and the standard of living. Tea estate coolies are recruited from rural India and on arrival in Assam they showed a normal erythrocyte count, with Hb. deficient by about 25 per cent. and reduced cell volume.

The incidence of anaemia shows no seasonal variation. It increases in proportion to the length of the working day, though the reason for this is obscure. A group of 20 cases of masked anaemia in non-pregnant women showed microcytic and hypochromic anaemia, but two were examples of a definite clinical entity the author has called micro-macrocytic anaemia. The average incidence of anaemia complicating pregnancy was 24·3 per cent. of all deliveries after the 28th week, but it varied greatly on different estates, and was highest among women delivered in the third quarter of the year. It is the most important cause of maternal mortality in this class, and increases the risk of premature still-birth.

The author advances the theory that the common anaemia in coolies apart from pregnancy is due to a more widespread cause than

either malaria or ankylostomiasis and this is probably a long-standing dietary defect. In pregnancy a new feature appears, for a large proportion tend towards the macrocytic hypochromic type, and it is suggested that these cases are due to concurrent dietetic deficiency, the presence of the foetus, and chronic malaria acting on an already inefficient haemopoietic system. [The detailed discussions in this painstaking paper cannot be readily summarized.] *W. P. Kennedy.*

NAPIER (L. Everard). **Anaemia in Pregnancy in India : the Present Position.**—*Indian Jl. Med. Res.* 1940. Apr. Vol. 27. No. 4. pp. 1009–1040. [62 refs.]

Anaemia is a major cause of the high maternal mortality in India The incidence is greatest in the second half of the year. Oedema occurs in nearly all cases, fever in more than half, albuminuria and diarrhoea in 25 to 50 per cent., and most reports mention relatively frequent splenic enlargement, while some note more Wassermann plus cases than in the general population. The healthy city dwelling Indian living on a good mixed diet has a blood picture similar to that of Europeans in the West, but rural and poorer Indians have much lower haemoglobin levels and often other evidences of dyshaemia, while a large number are clinically anaemic. The aetiological factors responsible for this dyshaemia are wide spread in the particular populations. Three common types of anaemia are :—(*a*) A microcytic hypochromic iron deficiency anaemia associated with low iron intake and ankylostomiasis. (*b*) A macrocytic hyperchromic anaemia due to dietary lack of a factor present in autolysed yeast and in crude liver extracts, and which is not pernicious anaemia. (*c*) A second type of macrocytic hyperchromic anaemia distinguished from (b) by hyperbilirubinaemia (a positive van den Berg), a high reticulocyte count, and usually splenomegaly. It is probably associated with chronic malaria *and* a deficient diet.

In the later months of pregnancy an anaemia (physiological or due to relative dietary deficiency) is generally recognized in other countries. It shows an increased mean corpuscular volume. Pregnancy anaemia incidence in India is correlated with anaemia in the general population, but is higher. Pregnancy anaemia is more macrocytic though in some places this is masked by the microcytosis of iron deficiency. It is amenable to treatment in early pregnancy, but later it is only possible to arrest the blood deterioration till after labour, when an immediate improvement occurs.

The present hypothesis is that pregnancy anaemia is due to the several factors responsible for anaemia in the general population and to another factor associated with the presence of the foetus. Among the common factors known are ankylostomiasis, specific and general dietary deficiencies and chronic malaria. The foetus makes extra demands on essential food substance and Napier adduces some evidence that a toxaemia associated with the presence of the foetus also plays a part. *W. P. Kennedy.*

HARE (K. P.). **The Mode of Origin and Progress of Anaemia in Pregnant Tea Garden Coolies.**—*Indian Med. Gaz.* 1940. May. Vol. 75. No. 5. pp. 274–278.

Thirty-one women, anaemic at all stages of pregnancy, and 128 found to be anaemic after the 28th week were investigated. Four

groups were found :—(A) microcytic-hypochromic, comprising roughly half the cases ; (B) normocytic hypo-orthochromic, about one-tenth ; (C) micro-macrocytic hypo-orthochromic, about three-tenths, and relatively dangerous ; (D) macrocytic-hyperchromic, about one-tenth of the cases and very dangerous. The heaviest incidence of onset was in the third quarter of the year.

Monthly examinations of the patients produced evidence supporting the claim that cyclical changes in the blood picture occur in untreated anaemias, and also NAPIER'S belief that microcytic anaemia may alter in type. Hare suggests the primary cause of these anaemias is relatively excessive foetal demand for haemopoietic substances where the maternal intake is minimal. Absolute iron deficiency causes the severe cases of group A, and relative deficiency the remainder. Absolute deficiency of the extrinsic factor associated with vitamin B causes group D, and relative lack, group B. Group C is due to a relative deficiency of both iron and the extrinsic factor. This theory of causation also accounts for seasonal variation. *W. P. Kennedy.*

TAYLOR (Geoffrey F.) & MANCHANDA (S. S.). **Report on Twenty-Four Cases of Tropical Macrocytic Anaemia in Punjabi Men.**—*Indian Med. Gaz.* 1940. June. Vol. 75. No. 6. pp. 321–324.

Macrocytic anaemia is fairly common in the Punjab. The cause is mainly dietary deficiency ; in addition 20 of the series had ankylostomiasis, 12 malarial splenomegaly, 12 diarrhoea, and 2 syphilis. Sternal puncture of 19 patients showed increased normoblasts in 11, and increased megaloblasts in 8. One patient died and a description of the autopsy is given. Therapy with marmite and yeast orally, and liver parenterally, produced rapid improvement in 11, slow recovery in 7 ; 5 left before completion of treatment. The blood and sternal puncture picture appeared the same as in pernicious anaemia except that haemoglobinized megaloblasts were absent from the sternal puncture material. *W. P. Kennedy.*

O'CONNOR (K. J.). **A Short Clinical Note on "Foot Rot."**—*Jl. Roy. Nav. Med. Serv.* 1940. Apr. Vol. 26. No. 2. pp. 171–172.

Many treatments have been tried and many more suggested for a troublesome condition of the tropics and sub-tropics, known as "Foot-rot," "Hongkong foot" and by other names [see this *Bulletin*, 1931, Vol. 28, p. 396 ; 1932, Vol. 29, p. 272 ; 1935, Vol. 32, p. 185]. The author has found the following very successful :—

"The régime now established is as follows : (*a*) Wash the feet twice a day in soap and water and dry carefully ; (*b*) apply surgical spirit ; (*c*) paint on Fungoline "B" and allow to dry ; (*d*) apply 5 per cent. boric acid liberally ; (*e*) white socks to be worn, and changed daily, as mentioned above, the socks to be soaked in disinfectant, and boiled ; (*f*) after the acute stage has gone, which should take place in from three to twelve days, the powder is to be persisted with for at least four weeks."

Unfortunately the formula of Fungoline B is not stated, but the preparation is obtainable from Messrs. Elnahar Ltd., Great Marlborough Street, London, W. 1.

The author had previously tried all the usual treatments by gentian violet, mycosol, salicylic acid, eusol, etc. Under the form of treatment detailed above the condition has cleared up completely and so far has not relapsed. *H. H. S.*

DE MEILLON (B.). **[Report of the Department of] Entomology.**—*Rep. S. African Inst. Med. Res.* Johannesburg. 1939. pp. 30–37. [Summarized in *Rev. Applied Entom.* Ser. B. 1940. Nov. Vol. 28. Pt. 11. pp. 211–212.]

"Some of the information in this report has been noticed from other sources. *Anopheles gambiae*, Giles, *A. funestus*, Giles, and *Aëdes aegypti*, L., were included in a collection of mosquitos received from Angola. In connection with the finding of *Anopheles gambiae* on the Witwatersrand early in 1939, it is pointed out that in spite of the most thorough search, even in areas where every small pool was teeming with larvae, only 4 adults were found in dwellings. At the same time, 27 females were taken in dairy stables in the northern suburbs, and 11 out of 14 of them subjected to the precipitin test were positive for bovine blood, whereas none contained human blood; 8 of these females were dissected and found to be free from malaria parasites. These findings are contrary to the usual observations in an area where *A. gambiae* occurs, and it is suggested that, when breeding under unusual climatic conditions, it may change its habit and become zoophilous. With the first cold weather, the species disappeared; it could not be found in May and June, and up to January 1940 it had not reappeared. It seems unlikely that it will do so until the exceptionally widespread breeding that took place over the Transvaal in 1937–38 is repeated.

"Investigation of an outbreak of disease among farm labourers in the Transvaal resulted in the finding of numbers of the tick, *Ornithodorus moubata*, Murr., in the compound where the men were lying ill, and blood slides subsequently taken revealed the presence of spirochaetes. This is the first record of an outbreak of relapsing fever on the Transvaal highveldt.

"A flea survey of the Union is in progress, and an analysis of the records shows that 'wild' fleas have been taken on domestic rodents and 'domestic' fleas on wild rodents; moreover, some 'wild' fleas were taken on a patient suffering from plague, so that the suspicion that they may transmit plague to man is confirmed beyond reasonable doubt. *Protospirura muris*, in its adult stage an intestinal parasite of rodents, was recorded from *Xenopsylla eridos*, Roths., from the Orange Free State; hitherto this Nematode has been recorded from *X. cheopis*, Roths. It is probable that the flea becomes infected in the larval stage when feeding on nest débris contaminated with rodent faeces; rodents would then acquire infection by eating infected fleas. Larvae of *Hymenolepis nana* were found in *X. hirsuta*, Ing., and *X. brasiliensis*, Baker. Examples of *X. cheopis* fed on a guineapig infected with human louse-borne typhus failed to transmit the disease when subsequently fed on a guineapig or a rat. In an experiment in which batches of 50 very young larvae of *X. brasiliensis* were placed in sand, provided with food and reared at about 76·5°F. and relative humidities of about 33, 51, 65 and 73 per cent., the numbers of adults obtained were 0, 41, 44 and 43, respectively. The ability of this flea to complete its life-cycle at a relative humidity as low as 51 per cent. explains the fact that it commonly breeds in the débris on the floors of sheds, garages and huts, in which the humidity is much lower than in the nests of burrowing field rodents. A single experiment to determine whether the larvae could migrate to the moister depths if the surface of the soil was dried off showed that all died in the dry surface.

"Beetles received from Bechuanaland, where they have been observed to cause painful blisters, have been identified as *Epicauta bisignata*, Mäkl. A further case of intestinal infestation with Coprids of the genus Onthophagus was reported during the year; the beetles had been passed by a native child."

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SINTON (J. A.) & SHUTE (P. G.). **Memorandum on Measures for the Control of Mosquito Nuisances in Great Britain.**—Ministry of Health. Memo 238/Med. 29 pp. With 2 plates. 1940. London: H.M.S.O. [6*d*.]

HAMILTON (D. G.). **Tick Paralysis: a Dangerous Disease in Children.** —*Med. Jl. Australia.* 1940. June 1. 27th Year. Vol. 1. No. 22. pp. 759–765. With 5 figs. [12 refs.]

This is a very full account of tick paralysis in Australia, with notes of 7 cases, all in children. It is well known that tick paralysis is a dangerous disease in dogs, but it is not sufficiently realized that it can affect man and may be fatal in children. The ticks incriminated are *Ixodes holocyclus* in Australia, *Dermacentor andersoni* [and also *D. variabilis*, see this *Bulletin*, 1939, Vol. 36, p. 577] in America, *Ixodes pilosus* in Africa and *I. ricinus* in Europe. Various domestic animals are susceptible, but all native fauna are probably immune. The disease consists of a widespread lower motor neurone paralysis which commences after the tick has been feeding for some days. The height of the weakness is reached about 48 hours after the tick drops off or is removed, but if this period of maximum paralysis is passed, recovery sets in and no residual paralysis is left. The paralysis may be purely local and a bite on the face or in the ear may cause nothing but facial paralysis.

Ixodes holocyclus is the sole tick to be incriminated in Australia and it occurs only in a narrow belt a few miles wide along the east coast of New South Wales and Queensland and in a similar belt in Western Australia. The tick needs ample rainfall and a warm temperature and depends on the presence of bandicoots which are the hosts of both immature and mature forms. Only the mature female causes paralysis but many mature females are non-toxic. There is good evidence that the venom is produced in the salivary gland.

In treatment removal at the earliest moment is essential, but when the tick is engorged it may be dangerous to grasp it with forceps, since this may squeeze toxin from the enlarged glands into the patient and may increase the paralysis. It is wise, therefore, to excise a small piece of skin to which the hypostome is attached, without squeezing the tick and after it has been killed with ether. Emphasis is laid on careful search for ticks in cases of paralysis. An antiserum has been prepared and is useful in doses of 10 to 20 cc. intramuscularly, repeated if necessary. Other treatment is symptomatic.

Motor function alone is paralysed, and this suggests that the lesion is in the cord. Whether spread of the toxin is by the blood or along the nerves has not been determined, but the author refers to the spread of tetanus toxin and of neurotropic viruses along the nerves and suggests that the same route may be taken by tick toxin.

The symptoms are set out in detail and notes are given of 7 cases of which 2 were fatal. [See also this *Bulletin*, 1939, Vol. 36, pp. 575–578.] *C. W.*

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